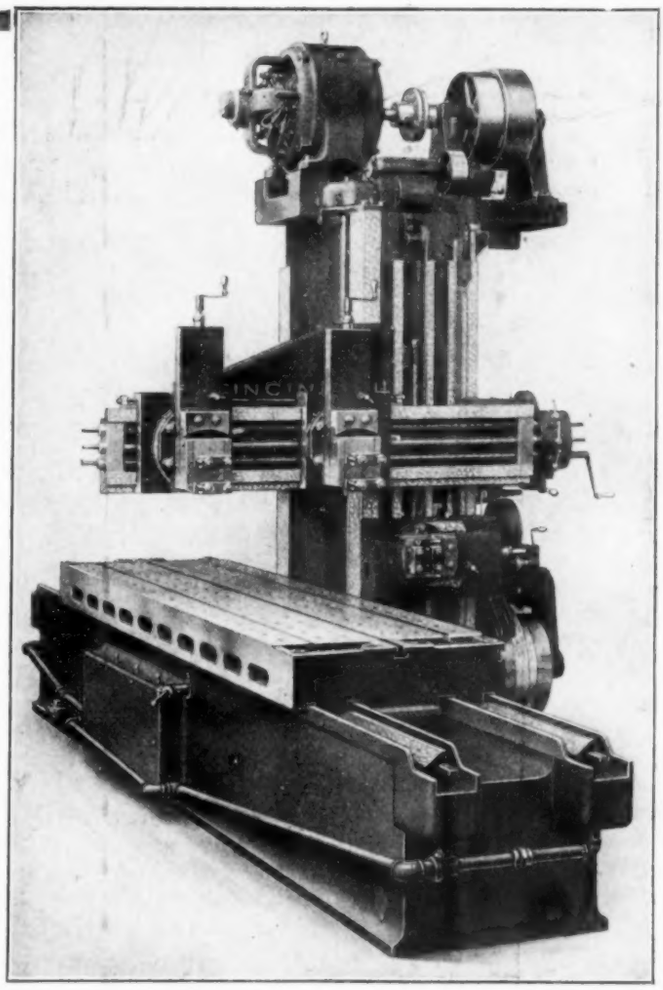
April 17, 1919 American Machinist Vol. 50, No. 16

Cincinnati Open-Side Planing Machines

Up to the present time the Cincinnati Planer Co. has confined itself to the manufacture of planing machines of the double-housing type. The open-side machine described in this article is a new product for this concern and should be of much interest to any one having work to do that could be handled on a machine of this kind.



THE Cincinnati Planer Co., Cincinnati, Ohio, has just placed on the market a new and complete line of open-side planing machines. This is a new line for this concern, and it is stated that care has been exercised in the design so the features embodied in the double-housing type planing machines manufactured are now incorporated in the open-side type of machine.

The machines are manufactured in three sizes, 36 x 36 in., 48 x 48 in., and 72 x 72 in. The points of superiority cited are power rapid traverse for the rail heads, a box-type table, forced lubrication of the Vs, a patent "tu-speed" drive on the 36-in. and 48-in. machines, quick-reverse aluminum pulleys, an extra capacity table, a box-type bed closed on top, a bed bored for shaft bearings by means of jigs, a bull wheel revolving with the shaft in bearings at the side, bronze bushed self-oiling loose pulleys, a self-releasing combination friction, patent gear-shaped tumbler and dogs, a safety locking device, a down-feed screw and collar of one-piece construction, ball bearings on the down-feed screws, down-feed screws in tension at all times, adjustable taper gibs throughout, a vertical slide maintaining a full bearing on the harp at all times, micrometer collars for horizontal and vertical feeds, simplex feed gears, a patent power-elevating device, and all gearing completely covered. The side head has a long narrow guide for the saddle on the column; an independent adjustable-feed gear, and a handle for the vertical movement; a self-contained counterbalance system, and a releasing latch handle for the tool block.

The headpiece and Figs. 1 and 2 illustrate one of the machines from various points of view. The rail heads are provided with a rapid power traverse mechanism, this feature enabling the operator to quickly adjust the heads to any desired position by power. The Vs of the bed and table are oiled by forced lubrication from a pump which delivers the oil into the Vs directly under the tool point, and from this point it is distributed over the entire length of the bed to either end, from where it returns to the tank, the oil passing through two strainers before it is again used. It is stated that this feature is especially desirable where heavy loads are carried by the table. For planing work that is wider than the table, the use of an auxiliary rolling table is recommended, this being supplied at extra cost if desired. The 36-in. and 48-in. machines are regularly furnished with a "tu-speed" drive, giving two cutting speeds and a constant speed return, but where a greater number of speeds are needed either reversible or non-reversible motor drive is furnished, these requiring direct current.

The bed is of heavy-box section, and is especially strengthened where the gearing and column are mounted. Heavy T-shaped girths at short intervals tie the walls together, and further strength is added by closing in the top between the Vs with an integral part of the casting. This feature also serves as a safeguard against accidents to the operator. The column seat is deep and wide, providing a large surface for the column fastening, and is entirely inclosed on all sides. The length of the bed has very little overhang of the table when planing at full stroke.

The column is of box-type construction and is fastened to the bed by tongues and grooves in addition to the regular bolts and dowel pins. It is made with considerable taper toward the bottom, this design being

said to resist the combined bending and twisting stresses and to prevent springing under a heavy cut when the heads are working at the extreme position on the cross rail.

The table is of the box type, the bottom being entirely closed. Heavy ribs at short intervals tie the top and bottom securely together, and prevent springing either when clamping work upon it or while it is at the limit of its travel. The T-slots are planed from the solid (not cored), the center slot extending the full length of the table. Stop holes are drilled and reamed throughout the entire surface of the table. By drilling extra holes at each corner of the table and by carrying the center T-slot the entire length, it is possible to plane from 6 to 10 in. longer than the rated capacity of the machine. Making the under side of the table solid also prevents dirt and chips from falling through the holes into the ways. Each section of the rack is bolted and doweled to the table. A view of the bottom of one of the tables is shown in Fig. 3.

The gearing and rack are cut from the solid by a system of special cutters for each gear, this method giving a smooth-running machine, and insuring strength and long life. All the large gears and racks are made from semi-steel castings, and the pinions from steel forgings. All gearing is completely covered for protection against accidents.

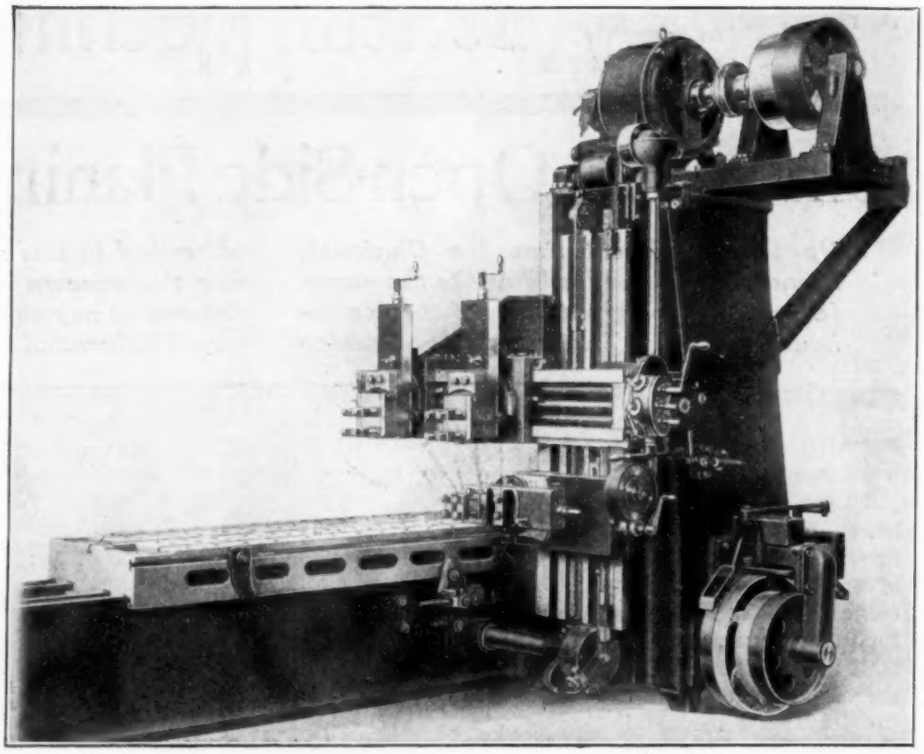


FIG. 1. A SIDE VIEW OF THE CINCINNATI OPEN-SIDE PLANING MACHINE

Specifications for 36 x 36 in. planing machine: Length of table, 8 ft.; capacity under knee, 37 in.; will square down in width, 44 in.; if tool is swivelled will plane about 54 in.; length of bed, 13 ft. 4½ in.; depth of bed, 24 in.; depth of table, 9¼ in.; width of table, 32 in.; depth of rail, 13¾ in.; length of down-feed, 15 in.; height of rail bearing on column, 28 in.; width of knee bearing on column, 45 in.; width of cutting belt, 2½ in.; face width of bull wheel and rack, 7½ in.; size of motor, 15 hp.; maximum speed of motor, 700 r.p.m.; total height without motor, 107 in.; total width without motor, 105 in.; weight, 22,000 lb.; weight per extra foot of bed, 1100 lb.

Specifications for 48 x 48 in. planing machine: Length of table, 10 ft.; capacity under knee, 49 in.; will square down in width, 52 in.; if tool is swivelled with plane about 62 in.; length of bed, 16 ft. 9 in.; depth of bed, 23 in.; depth of table, 10 in.; width of table, 40 in.; depth of rail, 15½ in.; length of down-feed, 18 in.; height of rail bearing on column, 30 in.; width of knee bearing on column, 54 in.; width of cutting belt, 3 in.; face width of bull wheel and rack, 8½ in.; size of motor, 25 hp.; maximum speed of motor, 700 r.p.m.; total height without motor, 122 in.; total width without motor, 135 in.; weight, 34,000 lb.; weight per extra foot of bed, 1500 lb.

Specifications for 72 x 72 in. planing machine: Length of table, 12 ft.; capacity under knee, 73 in.; will square down in width, 76 in.; if tool is swivelled will plane about 91 in.; length of bed, 19 ft. 11 in.; depth of bed, 23 in.; depth of table, 11½ in.; width of table, 62 in.; depth of rail, 20½ in.; length of down-feed, 25 in.; height of rail bearing on column, 40 in.; width of knee bearing on column, 75 in.; width of cutting belt, two, 3 in.; face width of bull wheel and rack, 12 in.; size of motor, 40 hp.; speed of motor, 700 r.p.m.; height without motor, 156 in.; width without motor, 170 in.; weight, 65,000 lb.; weight per extra foot of bed, 2100 lb.

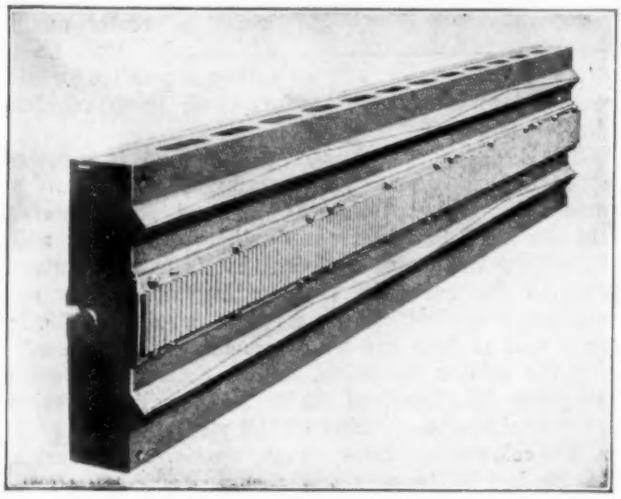


FIG. 3. A BOTTOM VIEW OF THE TABLE

The driving shafts are made of 75-point carbon steel, and are ground, after the splining and all work has been done, to insure accuracy. Large reservoirs with self-oiling wicks furnish continuous lubrication to the shaft bearings. Each bearing is provided with a small reservoir, and an oil groove is cut on the inside at the top and bottom. The bearings for the driving shafts are ground internally and are fitted into the bed, the holes in the bed being bored out to a jig. No bushing is less than 7 in. long. The entire construction is shown clearly in Fig. 4.

Knee and Crossrail

The crossrail is bolted and doweled to the knee and is raised and lowered by means of a power-elevating device operated through frictions by the lever on the right side of the column. The knee is formed at the top to provide a long bearing on the face of the column; it is also provided with a narrow guide arrangement with taper gibs and clamps.

The heads are distinctive, the end of the tool block and slide being made round to avoid projecting corners on angular work. They are scraped to the rail, and are graduated for swiveling up to 90 deg. They have automatic feeds in all directions, and can be operated from

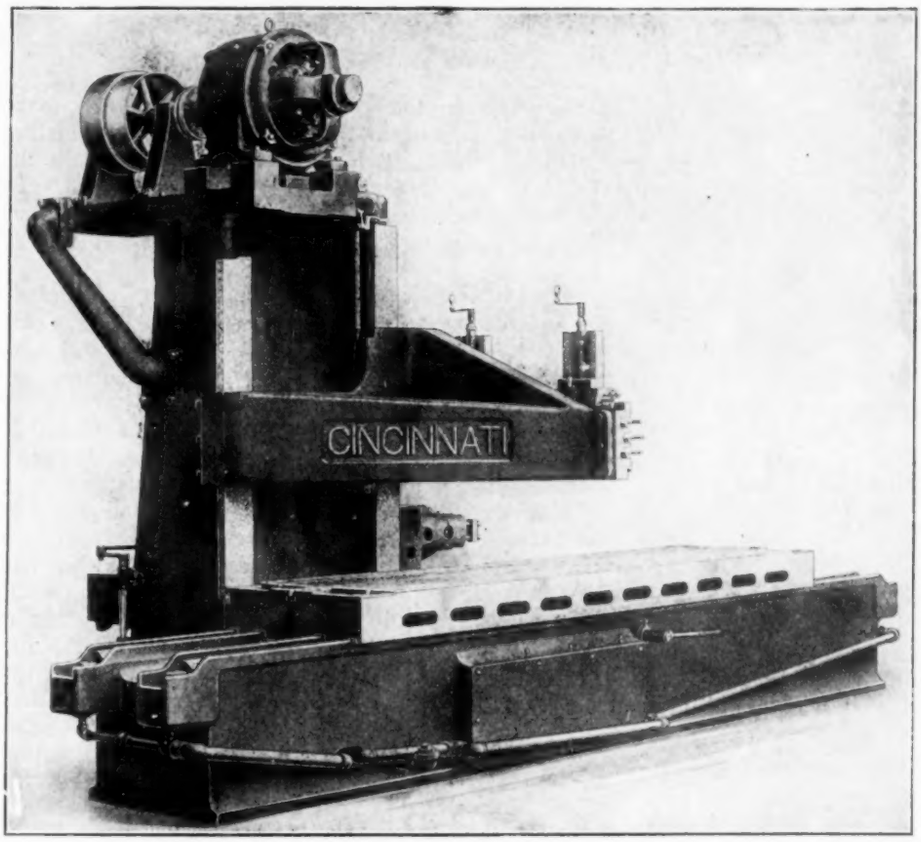


FIG. 2. A BACK VIEW SHOWING THE METHOD OF BRACING THE CROSSRAIL

either side of the machine. The saddles being right and left, the heads can be run very close together. The tool block swings on a tool-steel taper pin, and carries four steel bolts for clamping the tool. Tool-lifting devices can be furnished at a slight additional cost when desired.

Adjustable taper gibs, as shown in Fig. 5, are incorporated in all heads. The slides are also hung on ball bearings, which allow them to work freely.

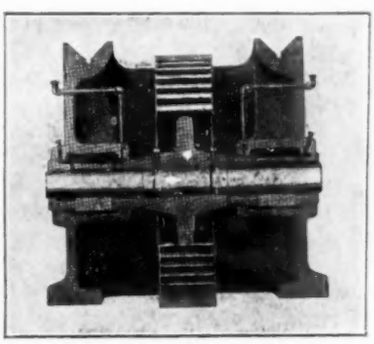


FIG. 4. METHOD OF CONSTRUCTING THE BOXES FOR THE DRIVING SHAFT

Side heads can be furnished on all sizes. These are provided with independent power and hand vertical feed, and can be run below the top of the table when not in use. The handle which controls the side head travels up and down with the head, and is convenient to the hand of the operator. Weights and wire cables are furnished for counterbalancing, without extra charge.

Micrometer dials are furnished on all down- and cross-feed screws, and consist of collars graduated in thousandths. The feed racks are cut from bar steel, and the pinions, which mesh with them are also made of steel, insuring long life.

The feeding device, shown in Fig. 6, is of new design and is said to have many improvements over the old style, in that it has all the trigger and spring mechanism inclosed, there being only the handle for operating the pawl on the outside. Every detail of this device is made by jigs and all parts are interchangeable. The construction is such that in removing the gear from the rod or screw all parts remain in place.

The shifting mechanism is said to transfer the belts quickly and noiselessly when running at the highest speeds. The belt arms are provided with an adjustment that keeps them in proper position at all times, and are provided with an extra support on the bracket which relieves the fulcrum stud from undue strain, doing away with the usual wear at this point. The studs are hardened and ground. The cam and rollers are protected from dirt by a cover, which entirely incloses the mechanism. A drip pan is provided under the shifting mechanism for catching the oil, preventing it from getting on the belts. By means of shifting levers at both the front and rear the operator can control the motion of the table without walking around the machine. The safety locking device permanently locks the entire shifting mechanism, preventing the table from starting, except at the will of the operator. This is a valuable attachment, being a safeguard against accident and spoiled work. It consists of a spring plunger, which enters a seat in the bed, and holds the shifting lever in a fixed position.

Aluminum quick-reverse pulleys greatly reduce the power required at the moment of reverse and also increase the efficiency of the machine to a marked degree. Owing to the lightness of the metal used the greater part of the inertia at the moment of reverse is elimi-

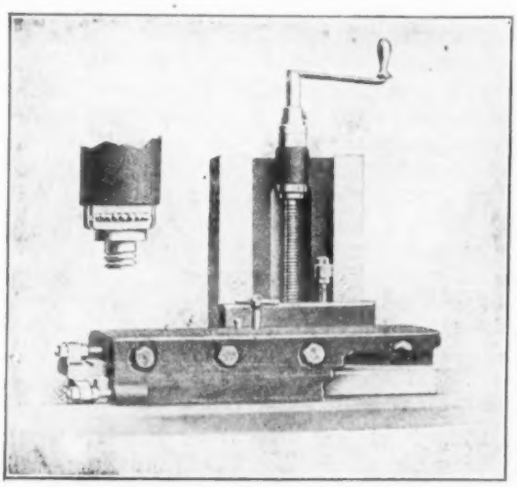


FIG. 5. THE TYPE OF ADJUSTABLE TAPER GIBS AND BALL BEARINGS

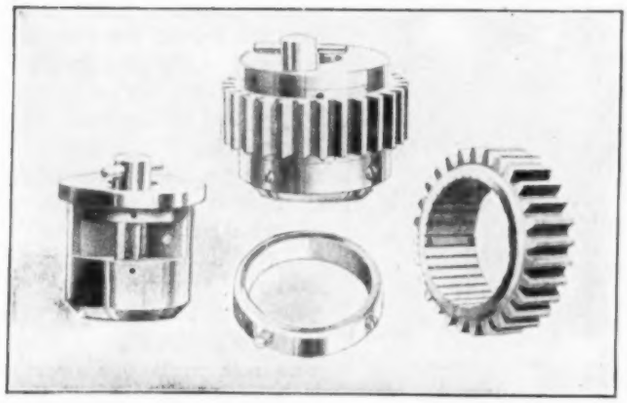


FIG. 6. THE IMPROVED FEEDING DEVICE

nated. Loose pulleys are provided with a new and proved self-oiling bronze bushing. The hubs are bored straight and the bushing driven into them. These bushings are cast so as to provide a large oil chamber, which holds sufficient oil to properly lubricate this part of the machine for at least one month. The bushings are provided with two grooves, into which are inserted strips of felt; the oil passes through the felt and lubricates the shaft.

Centralized Compressor Plant Versus Independent Compressors

BY FRANK RICHARDS

I was very much interested in the article in the *American Machinist*, Feb. 27, page 395, giving an account of the employment of compressed air for various operations in the manufacture of 155-mm. shells at the works of Winslow Brothers Co., Chicago, Ill. Many establishments were rushed last year in the production of munitions, and the plant among them which did not use compressed air for some of its work would have been a curiosity. In the example above referred to, the special uses of the air were for the chucks on lathes and boring machines, for varnishing and for sandblasting the shells. I was especially interested in the following portion of the detailed description which I here reproduce verbatim:

"An interesting feature of the air-compressing installation is that, instead of being grouped centrally in a power house, it is distributed about the plant at convenient points where the air is most used. This saves long lines of piping and makes for efficiency, as it obviates to the greatest possible extent drop in pressure, due to friction in the transmission line caused by elbows and turns."

Now, I feel compelled to say at once without hesitation and without apology, that while the feature to which attention is thus called is certainly "interesting," it is also to me most surprising. It is at variance with all experience and practice, and the claimed advantage is absurd. A single compressor could have been installed in the power house of the works, or anywhere most convenient, the air could have been distributed throughout the establishment, and the pressure maintained so that there would not have been more than 1 lb. of pressure drop at the remotest point. This may be substantiated by the records of hundreds of compressed-air installations where the pressures carried are anywhere up to 80 or 90 lb. gage, and the distribution areas very much larger than in this case. Here there were four similar compressors, two-stage, with air cylinders 14 in. and 8¾ in. respectively, with a common stroke of 10 in.—quite small machines as compressors go today. A single machine, the exact equivalent of these in theoretical capacity, would have had at the same piston speed, air cylinders 28 in. and 17½ in. in diameter; but, with the greater piston speed permitted to the larger machine, air cylinders 24 in. and 14 in. in diameter would have fully equalled the air output.

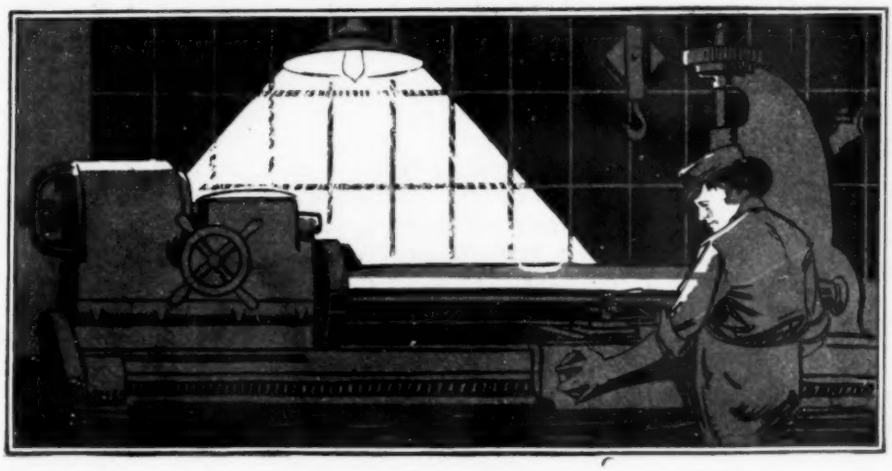
Under the conditions which rule wherever compressed air is employed, and especially was it so in this case, the air is used intermittently, and the demand for the air at the source of supply is irregular. The consumption of air in operating the various chucks spoken of must have been very small, since they are worked by static pressure and not by flow or loss of air. By far the larger volume of the air, we must assume, was used for the varnishing and the sandblasting, and especially the latter, since for these, when actually operating, there would be a continuous discharge of air; but here too the work was not continuous for any machine, and the machines would seldom, if ever, be operating all at once. The demand for air from each of the four compressors was of course never coincident with that of either of the others. The air demand would have been much better averaged and equalized if all the air had been drawn from a single compressor, and a single air receiver, approximately equal in capacity to that of the four smaller ones would have been better to meet the demand.

Having regard to the fluctuating and unequal air consumption, it would seem, from all that appears, and from all that may be legitimately inferred, that a single central compressor with cylinders 20 in. and 12½ in. in diameter would have afforded a sufficient supply of air in this case. The cost of such a machine might be about one-half of that of the four smaller ones. The single line of distributing pipe would probably cost less than the extra shafting, pulleys and belts, and the piping for cooling water for the four isolated machines. The extra cost of attending the four separate machines, the multiplicity of the lubrication, the fourfold liability of stoppage for repairs, need not be spoken of.

The article which we have been considering calls attention to the special air-drying arrangement provided for the air to be used for the sandblasting. With a single air compressor, an effective aftercooler and a separator, the latter operating upon the air when at its highest pressure and at its lowest temperature, or when its moisture carrying capacity would have been at the minimum, would have provided the advantage of dry air for all the purposes for which it was used, instead of for the sandblasting alone.

The Useful Life of a File

A French investigator states that the useful life of a file is on an average 25,000 strokes, which is equivalent to two full working days of 10 hours each. Files should be discarded as soon as they have passed through the period of useful life, because worn files are expensive to use. It has been estimated that counting the workman's time and overhead charges a new file would be capable of turning out an amount of work valued at $4.60, which when using an old file would cost $10.60.—*Brass World.*



LIGHT, ELECTRICITY and The Shop

By C. E. Clewell

Old and New Shop Circuits

This article discusses the question of electric circuits for shop motors and lamps. A comparison is made between the conditions in the small shop and those in the larger industries or where additions are made to what was originally a small plant. Notes are included concerning some of the operating features of motors and lamps. Standard practice in the matter of voltages, frequencies and phases for alternating-current shop work is referred to, with a statement of the allowable variations of these elements on the operation of shop power appliances.

IN EARLIER shop practice there was a more or less general tendency to employ direct current for distributing electric power. With the natural growth of such shops and the accompanying expansion into new buildings, the question is faced regarding the policy to adopt in the matter of extensions of electric-power circuits. It is well to keep in mind two principal points. One relates to the question of which of the two methods known as direct-current and alternating-current distribution is the better and the more economical to use, and the other is concerned with which type of motor will be better suited to the needs of machine tools and machinery in general.

From the standpoint of the distribution of power without any regard to the apparatus to be operated either direct or alternating current may be employed economically, provided the distances over which the power is to be transmitted are small. When the size of the plant is large, as where a number of buildings must be supplied and where the yard area over which the buildings are distributed is great, it is not usually economical to use direct current.

The reason for this is that there is no convenient and inexpensive way by which to transform direct current from one voltage or pressure to another as is the case with alternating current. The direct current must usually be generated in the power house, distributed over the circuits and utilized at the motors and lamps at essentially the same voltage, the value of this voltage being dictated in part at least by the requirements of the machinery it is to operate, its value in the average shop usually being quite low; that is, 110 or 220 volts except in special cases.

For the distribution of power by direct current the power is determined by the product of the voltage and the current, and hence if the voltage is low the current must necessarily be high. This means large and expensive wire conductors, and this feature is further emphasized if the distances become great. Thus the cost of the circuits becomes excessive and the interest

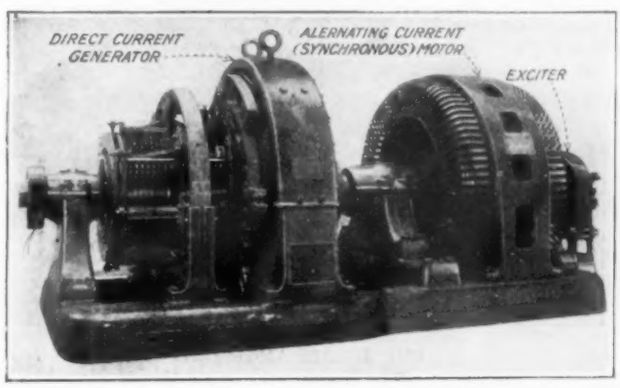


FIG. 1. MOTOR-GENERATOR SET FOR CONVERTING FROM ALTERNATING TO DIRECT CURRENT

and depreciation on the distribution system large. On the other hand, if the wires are not large enough the current fed through them means a large power loss in the distribution system.

In marked contrast the alternating system possesses the flexible characteristic which makes it possible to transform conveniently and economically from high to low voltage and the reverse by the so called transformer. The scheme adopted in this system is to use a fairly high voltage (often 2300 volts) for the transmitting circuits between the power house and remote buildings. This higher voltage means a low current for a given amount of power, and hence the cost of the circuits is reduced and the loss of power in the transmission and distribution can be kept down to a very small value.

The foregoing notes will show, therefore, why there is a very general tendency to use alternating current in the large central stations for the purpose of trans-

mitting and distributing power over large areas, and it is also readily seen that even where an industry has its own power house there is a marked tendency from the purely distribution side of the question to employ alternating current, particularly where the size of the shops is large and the areas involved are extensive.

Turning to the question of the motors and lamps used in the average shop we find that this apparatus as well as the matter of economy of electric-power distribution must also be considered in deciding between the two methods of electrical supply. Very little attention need be given to the question of electric lamps, since modern lamps for shop purposes in nearly all cases are available for operation on both kinds of circuits.

The adjustable-speed machine-shop motor, which has become so widely used for machine-tool work, is a direct-current motor with a ratio of maximum to minimum speed of 2, 3 or 4 to 1 as the case may be, and in which the speed remains practically constant at all loads when set for a given value.

Numerous types of alternating-current motors are available for shop work, but these are mainly of the constant-speed type, or they possess such marked limitations in the matter of speed control as to be removed from the class known as the adjustable-speed type. By constant speed is meant one fixed operating speed which stays practically constant at all loads. It is apparent, therefore, that the machine-shop field presents an advantage in the use of alternating-current circuits from the standpoint of the circuits themselves both in low first cost and in low operating expense, but that in a good deal of shop machinery the distinct advantages of the direct-current adjustable-speed motor makes the use of direct current a necessary part of the supply system.

There are, of course, numerous cases of shop machinery where the constant-speed alternating-current motor is well suited to the requirements. In such cases it is also equally possible to use a constant-speed direct-current motor if it happens that the supply of power has been limited to direct current for the benefit of those machine tools which call for adjustable-speed operation. In many cases both classes of circuits are available in the same shop plant.

Let us suppose that it has been decided to adopt an alternating-current system in the shop power house and that the use of alternating current has been found to be satisfactory for a great deal of the power equipment and for all of the shop-lighting load. It is possible that those machine tools which require an adjustable speed scheme of driving may make it desirable to have a certain proportion of the total power supply in the form of direct current.

Again, it may happen that the shop plant is to be supplied entirely from outside service such as that from a central power station and that the only available service is in the form of alternating current. In the first instance a direct-current generator may be installed in the shop power house for supplying the special needs of those machine tools which require adjustable speed drive; or in case it is found best to produce all of the electric power in the form of alternating current some form of conversion equipment to change the alternating to direct current may be employed, typified, for example, by the motor-generator

FIG. 2. ARRANGEMENT OF LIGHTING AND POWER CIRCUITS IN CONDUIT WIRING

set shown in Fig. 1, which may be used for converting from an alternating-current to a direct-current supply.

This latter scheme may also be employed where central-station power is purchased and only alternating current is available, a motor-generator set being installed in the shop for changing over any necessary proportion of the total purchased power into direct current.

By the term voltage of a circuit or of a motor is meant the electric pressure at which it is operated. The voltage of the supply circuits is governed partly by the voltages of the apparatus to be supplied and to some extent by conditions of safety around the plant.

To the items of voltage and frequency we may add that of phase. Motors for operation on alternating-current circuits in power work are usually either of the two- or the three-phase type, three-phase usually being preferable.

From the standpoint of circuit-operating conditions it is important to note the characteristics of motors at starting. Direct-current motors are usually provided with one of the well-known forms of starting controller with which the amount of starting current may be kept within certain prescribed values.

The squirrel-cage induction motor tends to take an unduly large current at starting unless the voltage ap-

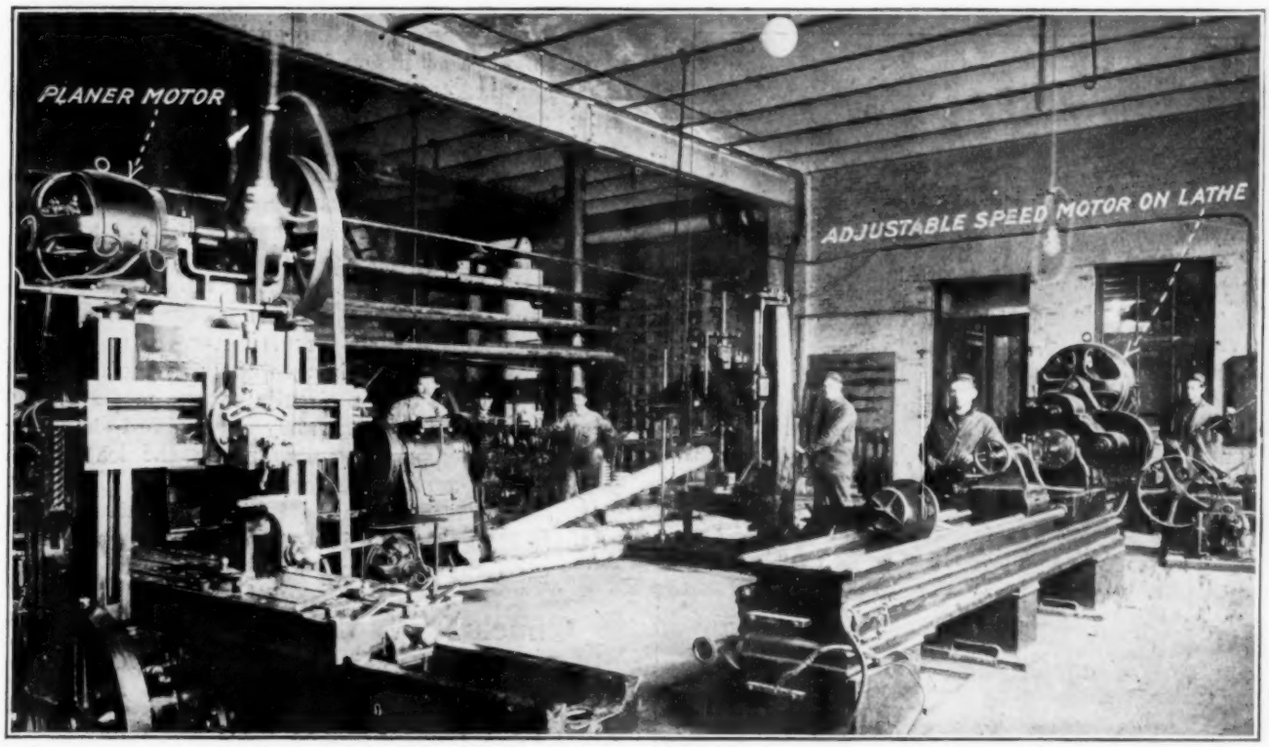


FIG. 3. GENERAL APPEARANCE OF A SMALL SHOP EQUIPPED WITH DIRECT-CURRENT MOTORS

According to broad lines of standardization of voltages as governed by the sizes of the motors, A. M. Dudley gives the following figures:[1] For motors up to 5 hp., 110 volts; up to 75 hp., 220 volts, which is probably the most generally used pressure in shop power work; voltages of 440 and 550 may be used for motors ranging from 7½ to 200 hp.; 2200 volts, from 20 to 1500 hp.; 3800 and 4000 for motors of 50 hp. and over, and so on. These higher voltages may be looked upon as special from the shop viewpoint. The voltage of supply circuits should not vary more than 10 per cent. either up or down from the rated value of the motor for highly successful operation.

The most widely used frequencies for alternating-current circuits (the term not applying to direct-current circuits) are 25 and 60 cycles per second. Dudley classes 60 cycles as the choice for general all-round work, the advantages of 25 cycles applying to heavy slow-speed motors, a variation of as much as 10 per cent. in frequency not greatly impairing the motor operation.

[1]Transactions of the American Institute of Electrical Engineers, Vol. XXXIV, 1915, page 740.

plied to the motor is reduced during the interval of starting. Too large a current at the starting point of such motors may cause an excessive voltage drop in the supply circuits and may consequently affect other apparatus on the same circuits. The well-known "auto-starter" is used in such cases to cut down the voltage at the motor terminals just at starting and then to raise it to its normal value a little after the moment of starting.

Auto-starters, according to the practice of one motor manufacturer, are arranged to reduce the applied voltage to 50, 65 or 85 per cent. of the full line voltage, 65 per cent. being the usual value employed. If the starting voltage is reduced too much the starting torque of the motor is greatly reduced. Hence a good rule to follow is to reduce the applied voltage low enough to keep the first inrush of current down to a reasonably low value, but to have the voltage high enough to insure a sufficient starting torque for the load requirements on the motor.

In the slip-ring induction motor provision is made for inserting an adjustable resistance in the circuit of the rotating member. This is inserted at starting very

much like the auxiliary armature resistance used for starting an ordinary direct-current motor. By its use the starting current may be kept down and good starting torque is provided. As the motor speeds up, this auxiliary resistance is cut out of the circuit. Some degree of speed control may be effected by means of this adjustable resistance, but to produce a change of speed by inserting resistance in the rotating member means that the speed change is increased with changes in load, and in this respect there is a great difference between the slip-ring induction motor and the adjustable-speed direct-current motor.

From the standpoint of keeping down excessive peaks of current when purchasing power from a central

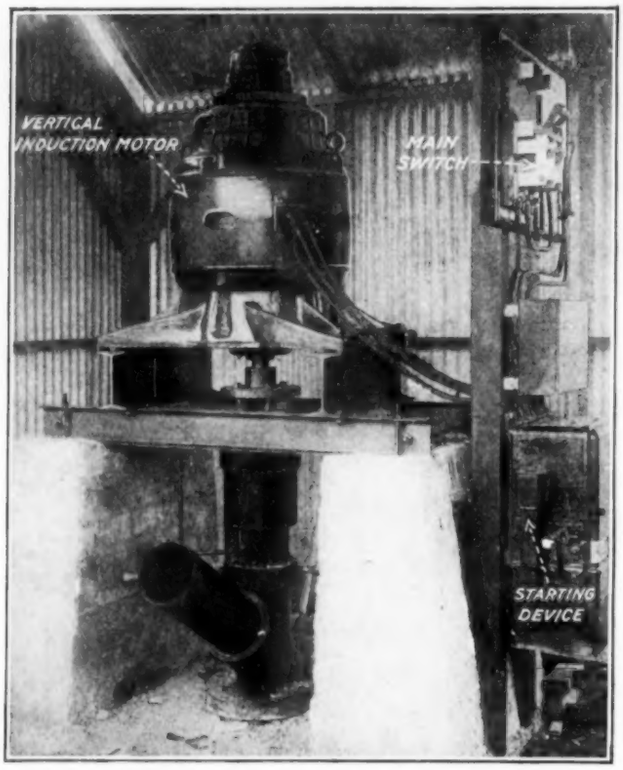


FIG. 4. APPLICATION OF A VERTICAL ALTERNATING-CURRENT MOTOR TO A LAYNE & BOWLER PUMP. NOTE THE WIRING ARRANGEMENTS TO THE RIGHT

station so as to obtain the advantage of a lower rate for power than otherwise, the foregoing notes on how to keep down the current at starting are very important. This is made more evident by a consideration of the following table of current in the line and starting torque in percentage of the normal full-load values for various values of voltage applied to the motor in terms of normal, from which it will be seen that to apply too high a voltage, that is a value not sufficiently below normal, to the terminals of a squirrel-cage induction motor, means usually a very excessive current.

This table also brings out the fact that too great a reduction of applied voltage may mean such a low starting torque as to prevent the motor from starting.[1]

In Fig. 2 a good idea of the form taken by well-arranged shop circuits is given. In the upper part of the illustration conduit wiring for lamps may be seen, and below in the foreground the neat appearance of concealed conduit power circuits is evident.

Fig. 3 gives some idea of the motor applications from direct-current circuits in a small shop space. In this view may be found a motor-driven planing machine and lathe, two motor-driven pipe-threading machines, a motor-driven drilling machine and a motor-driven sawing machine

TABLE OF CURRENT USED IN STARTING SQUIRREL CAGE MOTORS IN TERMS OF FULL LOAD TORQUE AND NORMAL VOLTAGE PERCENTAGES

Voltages on Motor, in Percentage	Current in Line, in Percentage	Starting Torque, in Percentage
33	75	22
50	175	50
66	300	88
100	700	200

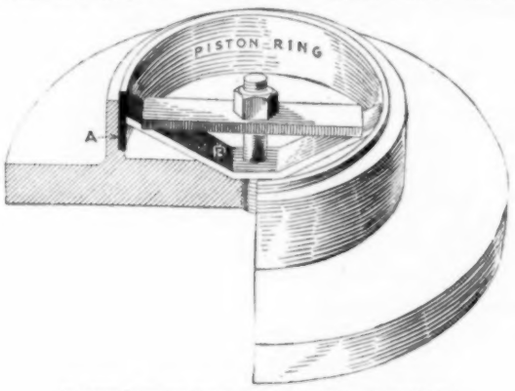
Fig. 4 shows an interesting application of a vertical alternating-current motor for driving a pump. Attention is directed to the main switch at the upper right-hand part of the illustration and the starting device at the lower right-hand corner.

Mention should be made that the electric circuits between the shop power house and the motors take the place of just that much line shafting. The successful operation of the lamps and motors supplied from such circuits depends to a large extent on the excellence with which the distribution system is planned. The obscurity of an electric circuit after its installation tends to its neglect as changes occur in the shop and the original loads on the circuits become modified. As a suggestion, therefore, a fairly close record should be kept of all the shop circuits and of the loading on each as well as the changes of load as motors are shifted from place to place to accommodate changes in the routing of materials and consequent rearrangements of machine tools and other machinery.

Chuck for Holding Piston Rings

BY A. P. M. WILKING

A simple and effective form of chuck for holding piston rings for grinding or other machining operations on the edges is shown in the drawing herewith.

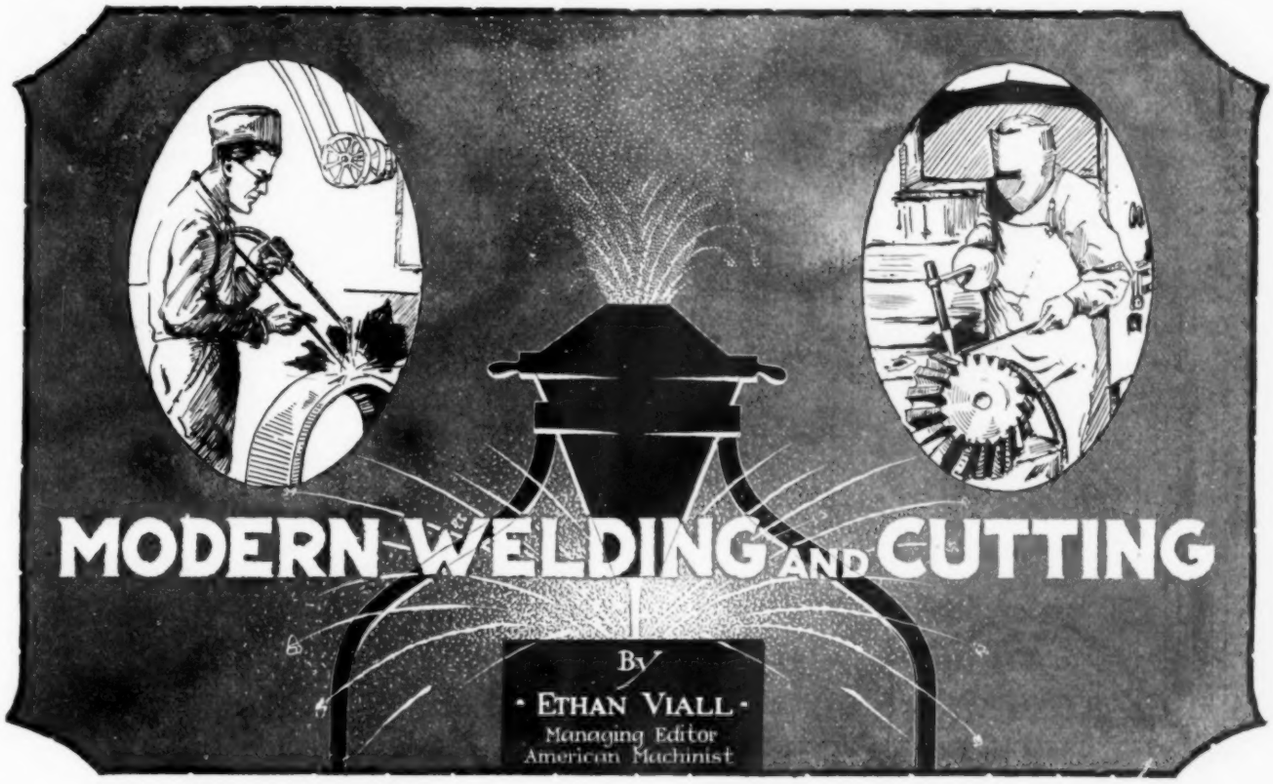


CHUCK FOR HOLDING PISTON RINGS

It is not of course expected to compete with a magnetic chuck but to be used as a substitute when the latter is not available.

The construction is adequately shown by the drawing. The seat *A* for the ring should be recessed to a diameter slightly larger than the inside diameter of the ring to facilitate removal of the latter, and the clamp *B* should be spring tempered to insure its releasing the work when the pressure of the nut is removed.

[1] This table is taken from the "Handbook for Electrical Engineers," John Wiley & Sons, Inc., page 1008.



IX. Oxygen and Hydrogen by the Electrolytic Method

Without oxygen, gas-torch welding or cutting would be impossible. The electrolytic process not only produces oxygen of great purity, but also produces hydrogen which is valuable for numerous purposes. This article shows how both oxygen and hydrogen may be obtained in commercial quantities from water by the use of very simple apparatus.

THE electrolytic process for the production of oxygen is more adapted to private installations than the liquid-air process. An electrolytic installation is flexible, and may be expanded so as to produce any commercial quantity of gas desired with very little attention. One big advantage of this process is that hydrogen is produced at the same time as the oxygen, and in many cases this hydrogen can be used to advantage for welding, cutting, or other purposes.

As a rule, oxy-hydrogen for welding is less desirable than oxy-acetylene, but for some purposes, especially when there is an abundance of hydrogen available, it is very satisfactory. The heat produced by the oxy-hydrogen flame (about 3632 deg. F.) is considerably less than that of the oxy-acetylene flame (about 6300 deg. F.), consequently it is commonly employed for welding thin metals, lead burning or other work within its heat range. As a general rule, oxy-hydrogen is good for welding 16-gage steel, or thinner, but should not be used on steel over $\frac{1}{4}$ in. thick. As hydrogen contains no carbon, the weld is softer than with acetylene. Cast iron up to $\frac{3}{4}$ in. in thickness may be successfully welded, as may also aluminum crankcases or alloyed metals. For cutting, however, oxy-hydrogen has a wide field, especially for heavy work.

General Principles of the Electrolytic Method

In an elementary form, decomposition of water may be effected by passing an electrical current between two metallic poles, or electrodes, immersed in water. By the admixture of acid or alkali, forming an electrolyte, the resistance of the water is lowered to allow a large current of electricity to pass, proportionately raising gas production. Simultaneously with the passage of current, decomposition of water into its components, oxygen and hydrogen, begins. Oxygen, exhibiting positive electrical properties, is formed on the positive pole or "anode"; double quantity of hydrogen is formed at the same time on the negative pole or "cathode." The gases are immediately available, and by interposition of a suitable diaphragm between the poles, are kept separate and led to their proper receivers.

The rapidity of decomposition, and consequently the amount of gases evolved being in direct measure of the electrical current passing, there is afforded convenient and economical means of producing commercial oxygen and hydrogen. The electrolytic solution increases in density as the action continues. The volume of water dissociated is therefore replaced at regular intervals.

Complete separation of the gases is desirable in order to insure their availability at high purity. This involves the use of a diaphragm, which, immersed in the solution, will allow passage of current between the poles and at the same time prevent mixing of gases.

The production of oxygen and hydrogen being in respect to the amount of current passing, it is apparent that the voltage required to send the specified amount of electricity through the electrolyzer is a measure of the efficiency of the apparatus, since, if the kilowatt-

*For the author's forthcoming book, "Modern Welding and Cutting." All rights reserved.

hour consumption is known, the gas production may be compared with it. Thus, there has been evolved the commonly accepted performance rating of any electrolyzer given in terms of cubic feet of gas produced per kilowatt-hour operation.

The production of pure gases is very important. In the earlier types of water electrolyzers the require-

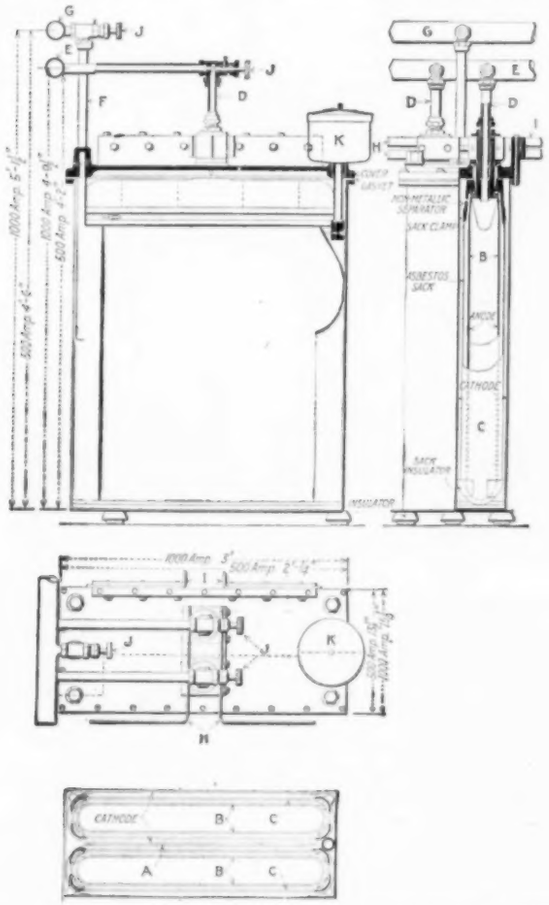


FIG. 88. DETAILS OF THE DAVIS ELECTROLYZER CELL

ments for producing gases of high purity were not understood, with the result that means of purification of the gases after generation were necessary. Devices of this character have been found expensive to maintain and inefficient in action. Modern designs of electrolyzers are capable of delivering oxygen of about 99 per cent., and hydrogen of equal or greater purity, so that the need for external purifying means no longer exists.

On delivery from the electrolyzers the gases are conducted separately to a pressure regulating device which imposes equal pressures on both oxygen and hydrogen, thus equalizing the pressures on each side of the separating diaphragm. The gases are then passed to their respective gas holders, in which they are collected and stored at a few ounces pressure. Upon the nature of service of the gases will depend the size of the gas holders, and the method of compressor control.

If it is desired to compress the gases into cylinders for shipment, as in the case of a commercial plant, large gas holders are employed having capacity for, at least, a continuous day's run of the electrolyzers. High-pressure compressors draw from these holders and discharge to a manifold to which the portable cylinders are connected. The pressure carried in the cylinders is usually 1600 to 1800 lb. per sq.in. Cylinders of 100 and 200 cu.ft. capacity will weigh about 85 and 150 lb. respectively.

There are many oxy-hydrogen producing equipments installed in industrial establishments, the gases being utilized in various portions of the works. In the Davis-Bournonville installations, gas holders of moderate size are employed, their rise and fall starting and stopping the compressor motors through automatic electrical control devices.

The gases may be stored in stationary pressure tanks to a moderate amount, these being fitted with automatic regulators, so that when they are filled to capacity, the entire plant will be shut down. The gases are piped, where desired, through pressure lines, thus avoiding the replacement of empty cylinders. This method of installation is particularly desirable for continuous welding and cutting operations, either by hand or

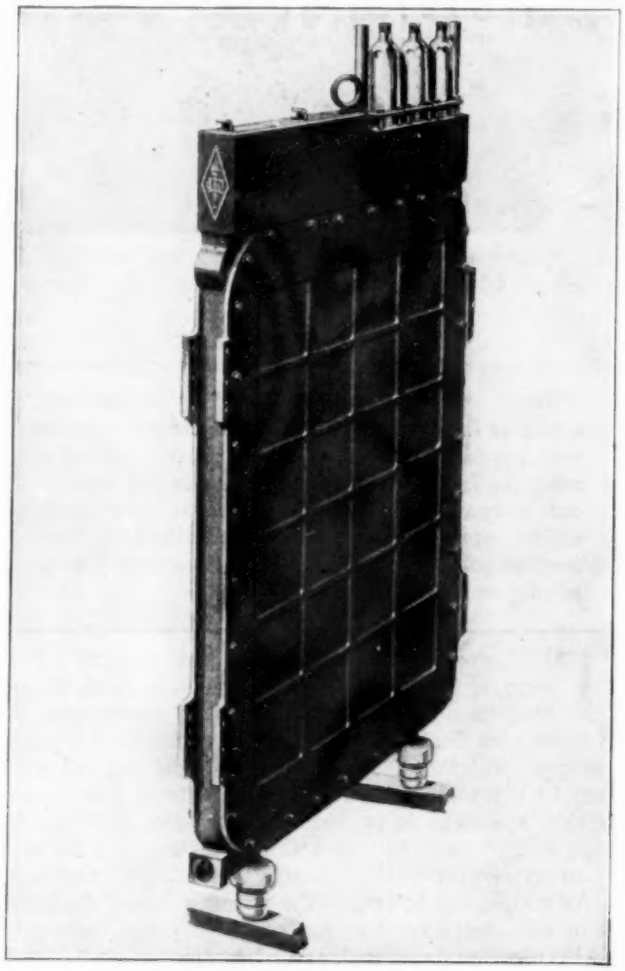


FIG. 89. CELL MADE BY THE INTERNATIONAL OXYGEN CO.

mechanical means. Provision may also be made for charging portable cylinders for use in operations carried on at isolated points.

Through the automatic control mentioned, the flexibility of an oxy-hydrogen generating and compressing equipment may be appreciated. The required amount of attendance being small, and needed only at regular intervals, continuous 24-hour operation of the equipment or intermittent service, if desired, is quite feasible and practicable. If maximum production is not desired,

reducing the current passing through the electrolyzers will proportionately lower the volume of gas that is being generated.

Details of the Davis Electrolyzer Cell

For various reasons, electrolytic installations are made up of small units or cells, which may be combined in such a way as to produce any required amount of gas. Details of an electrolyzer cell are shown in Fig. 88. This type of cell is made by the Davis-Bournonville Co., Jersey City, N. J. The type illustrated provides current conducting areas and gas generating surfaces amply proportioned to their requirements. There is

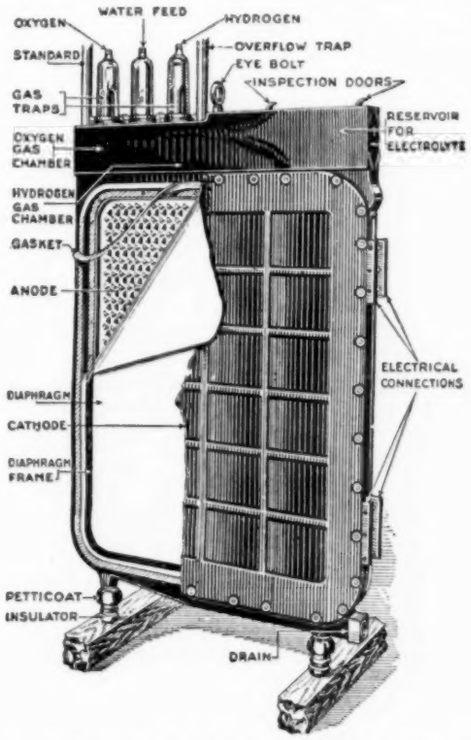


FIG. 90. SOME DETAILS OF THE CELL CONSTRUCTION

sufficient over-capacity to minimize electrical resistance and afford high working efficiency. Long life of the vital parts is also insured. Research has shown that a nickel-iron-alkali combination of elements employed for electrolytic dissociation of water is a very efficient selection from an electrical input and gas producing standpoint. Parts subject to deteriorating action of any character are constructed of special material and protected by processes especially adapted to service requirements. Care has been exercised in the design so as to avoid complication of electrical and mechanical connections of small cross-section. Thus studs, bolts, busbars and their contacts are amply large for all purposes.

These electrolyzers are manufactured in two sizes, operating on specified currents of 500 and 1000 amp. respectively. The dimensions of the respective cells are 54 and 61½ in. high, 13½ and 15⅛ in. thick and 24½ and 36 in. wide. The height given is from the bottom of the cell to the center of the highest horizontal tube, through which the hydrogen passes into the service pipe.

In stating the production of gases evolved by dissociation of water the commonly accepted formula employed specifies production of 7.93 cu.ft. of oxygen with double quantity of hydrogen per kilo-ampere-hours at normal temperature and pressure. The normal production of Davis-Bournonville electrolyzers may therefore, according to their booklet, be stated as follows:

Type	Normal Amperage	Hourly Gas Production Oxygen	Hydrogen
5	500	3.96 cu.ft.	7.92 cu.ft.
6	1000	7.92 "	15.84 "

at 20 deg. C. and 760 mm. barometer.

The closed-cell type of construction adopted eliminates the absorption of carbon dioxide (CO_2) by the solution exposed to the atmosphere in the open type of electrolyzer, and its consequent deteriorating effect upon the electrolyte and purity of gases. Electrical current passing through the electrolyzer is converted almost entirely into chemical energy for producing oxygen and hydrogen. There being practically no action on the electrolyte employed as a conducting medium between the poles other than the dissociation of water, it is evident that the electrical pressure or voltage required to send the specified amount of electrical energy through the apparatus is a measure of its efficiency.

Referring now to the illustration, it should be kept in mind that the solution used is water with certain

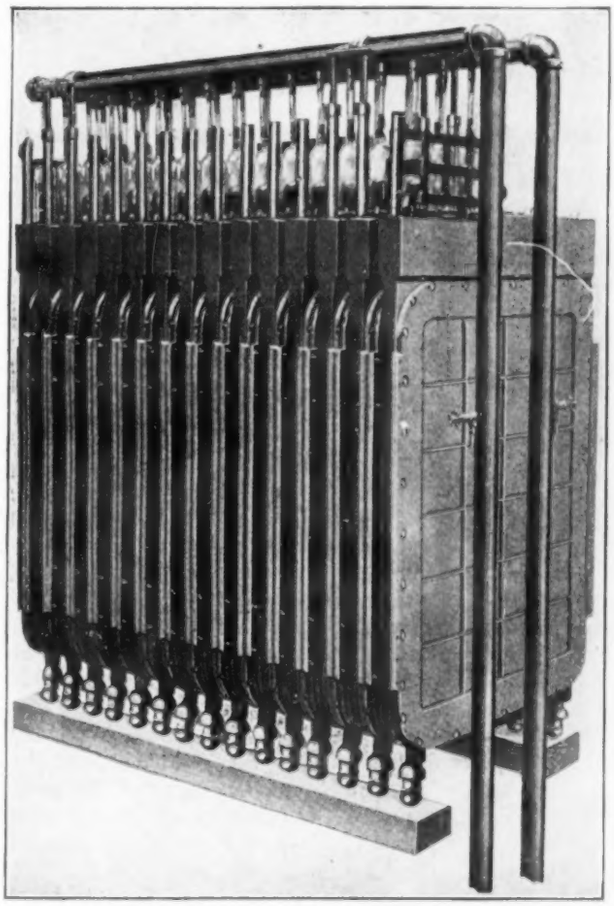


FIG. 91. A GROUP OF I. O. C. CELLS

chemicals, such as sodium hydroxide (caustic soda) or potassium hydroxide (caustic potash), added to increase the conductivity. The reservoir in which the solution is placed, is divided by a metal plate *A*. Anodes *B* are suspended on each side of this plate, and on these the oxygen forms. The cell itself is made of metal, and the walls of this, as well as the sides of the metal plate *A*, form the cathode or negative pole from which the hydrogen gas rises. To keep the oxygen and hydrogen separated, asbestos sacks *C* are so placed as to surround

each of the two anodes. The oxygen generated passes up through the hard rubber tubes *D* connected to the pipe *E*. The hydrogen passes up tube *F* into pipe *G*. The current to the anodes is conducted through the positive busbar assembly *H*. The negative busbar assembly, shown at *I*, is attached to and forms part of the cast-iron cover of the cell and connects with the center plate and the tank walls. Valves for the three

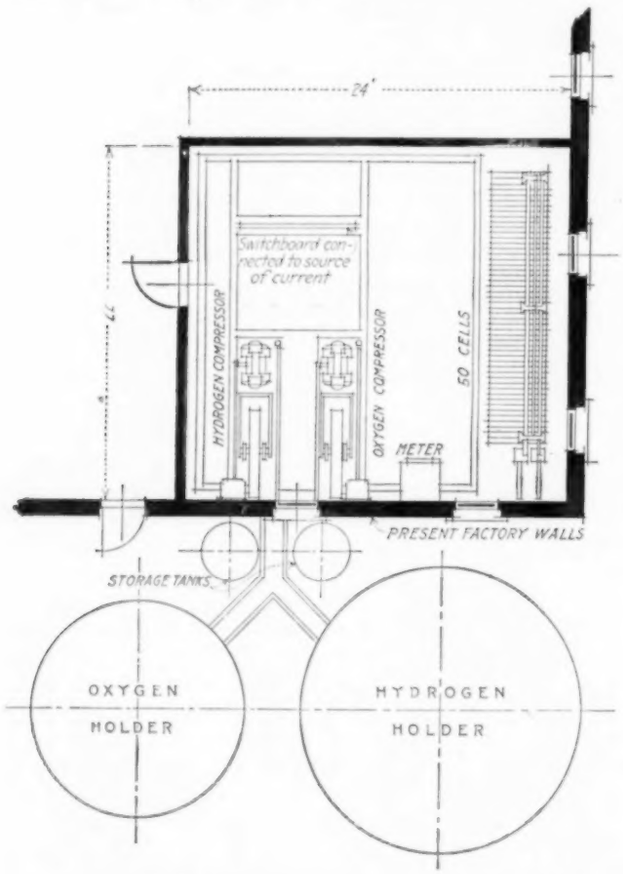


FIG. 92. SUGGESTED LAYOUT OF A 50-CELL PLANT

gas tubes are indicated by *J*. As the current passes through the cell the entire solution is charged and this results in the freeing of oxygen at the anodes and hydrogen at the cathodes. Since these gases have no tendency to pass off anywhere except at the respective terminals in the cell, the asbestos curtain effectively keeps them separated. The pressure of the two gases, however, must be kept the same or the one having the higher pressure will be forced through the fabric of the asbestos sacks and mix with the other gas. This is taken care of by having the gases from the pipes *E* and *G* pass through a combined flash-back and pressure regulator. The function of this device is to receive the gases; regulate their pressure through a simple water seal which equalizes the gas pressures inside the electrolyzer; separate and return to the cell any alkali carried over; provide means of replacement of water to the cell; bypass gases to the air if the delivery lines become obstructed, and to prevent admission of the flame to the electrolyzer.

The replacement of distilled water, as needed, is made through the reservoir *K*, which combines the replacement function with that of a hydraulic governor automatically adjusting the inner level of the solution. Under operating conditions, the usual replacement of distilled water amounts to approximately one gallon per 100 cu.ft. of oxygen and 200 cu.ft. of hydrogen. This replacement and the ordinary inspection usually given to electrical apparatus is practically all the attention required for a battery of cells.

The International Oxy-Hydrogen Generator

The electrolytic cell shown in Fig. 89 and in further detail in Fig. 90, is made by the International Oxygen Co., New York. Each cell unit requires a floor space 4 x 40 in., and with the necessary pipe connections, a head room of about 6 ft. These cells are intended to be run on a normal amperage of 600 and a voltage of 2.2 each, using a caustic soda solution. The possible range above and below the normal amperage is considerable, without injury to the cells. An equipment of their type 4-1000 cells can be operated with good economy over a current range of less than 200 up to 1000 amp., representing a production range of more than one to five. In actual figures this means that an installation giving 600 cu.ft. of oxygen and 1200 cu.ft. of hydrogen per 24 hours, at 600 amp., can by varying the current and without any alteration in the plant, be made

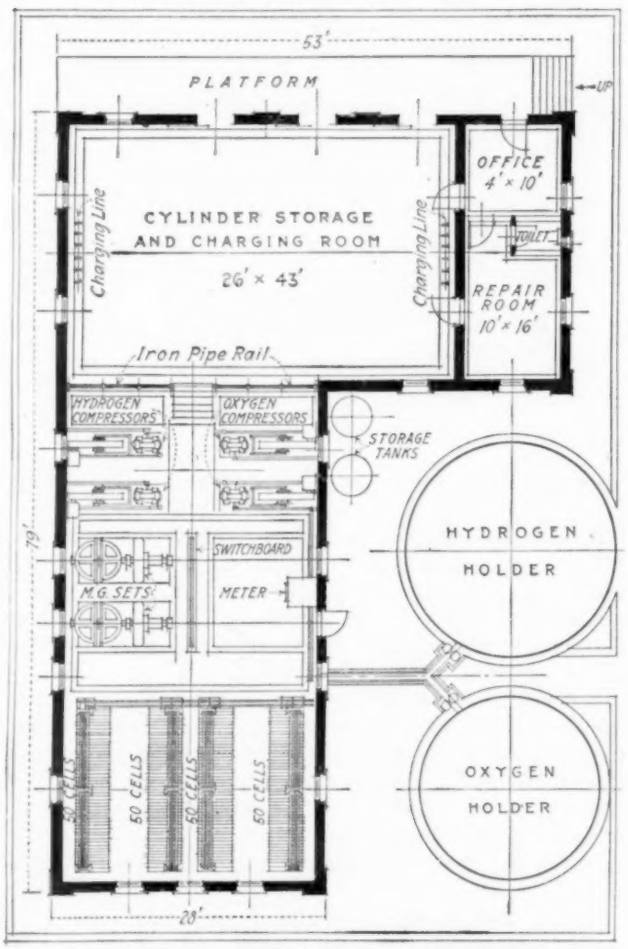


FIG. 93. SUGGESTED LAYOUT OF A 200-CELL PLANT

to deliver from less than 200 cu.ft. of oxygen and 400 cu.ft. of hydrogen, to more than 1000 cu.ft. of oxygen and 2000 cu.ft. of hydrogen per 24 hours. Operating at 200 amp., the power consumption per unit of gas generated is 16 per cent. less than the normal 600-amp. operation. When operating at 1000 amp., the power consumption per unit of gas is 15 per cent. more than at 600 amp.

Local rates will largely govern the number of cells required for a given output of the gases. Where the cost of current is low, the plant can be economically run on current above 600 amp., the increased production per hour giving the required amount with fewer cells, since the lower current cost justifies the slightly lower electrical efficiency. Where the price of current is high, it will be advantageous to use current less than 600 amp., thus taking advantage of the higher electrical efficiency, but more cells will be needed.

In general principles, this make of cell resembles the one previously described, though different in form. By referring to the illustration, it will be seen that a cell is made up of a thin rectangular-shaped box

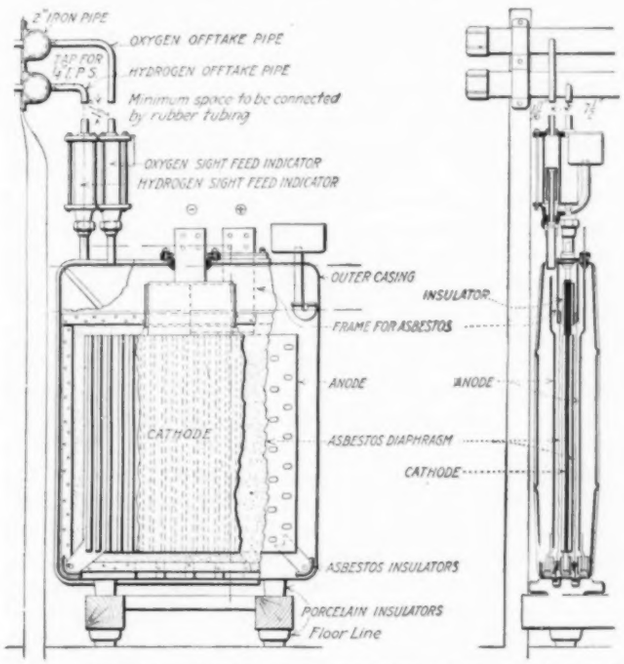


FIG. 94. CROSS-SECTION OF THE LEVIN GENERATOR CELL

frame to the sides of which are bolted two cast-iron plates or electrodes. The cavities formed between the center and side plates are divided by asbestos fabric diaphragms, forming two chambers. The asbestos diaphragms are clamped directly by metal and are not held in place by either rubber or cement. In the upper part of the cast-iron frame are reservoirs for the electrolyte, from which it is fed to the two sides of the diaphragms. There are also two gas chambers at the top of the frame, which serve as gas traps and gas take-offs, as well as an automatic pressure-controlling device. At the bottom of the frame are communicating passages which permit the equalization of densities in the electrolyte. The cells are constructed of material which make them practically indestructible. Each cell is provided with an eye-bolt to facilitate handling. The electrodes are provided with a large number of pyramidal projections which greatly increase the area of contact with the electrolyte and facilitate the release of the gases at the generating surfaces. At 600 amp. the production of a plant per 24 hours is 105 cu.ft. of oxygen and 210 cu.ft. of hydrogen per square foot of floor space. A group of cells is shown in Fig. 91.

Two typical plant layouts are shown in Figs. 92 and 93. Fig. 92 is a layout for a 50-cell plant, with a normal capacity of 5760 cu.ft. of oxygen and twice as much hydrogen. This plant may be put in a corner of an existing building, and requires a space 22 x 24 ft. It is complete with all accessories except gas holders and storage tanks. Fig. 93 is a separate plant of 200 cells, with all necessary accessories—such a plant as might be installed for public service in cylinders for gas users. Its main dimensions are 53 x 79 ft. and it has a normal capacity of 23,040 cu.ft. of oxygen and 46,080 cu.ft. of hydrogen per 24 hours.

The Levin Type of Generator

The generator made by the Electrolytic Oxy-Hydrogen Laboratories, Inc., Dayton, Ohio, and also of New York, is the design of I. H. Levin, after whom it is named. It is of the unit type, and is made up of a few standardized parts which can be easily assembled. Details of one of the cells are shown in Fig. 94. From this it will be seen that in the main the general construction is the same as others on the market. One noticeable difference from those described, however, is that the electrodes are made independent of the casing, being separated from and securely fixed within the casing by specially designed blocks of asbestos.

Each compartment has an independent water feed which also serves as a blow-off device to vent the gases under abnormal conditions. The surfaces of both the anode and cathode are plated with cobalt, which is said to lower the over-voltage or voltage in excess of what the gas electrodes require. The cells are sent out entirely welded, and completely and rigidly assembled, so that they may be filled with electrolyte, connected up, and put into service immediately. Each cell is 6¼ in. thick, 25 in. wide and 30 in. high, and weighs 185 lb. With the ground supports, porcelain insulators and the piping system above, the total height is 4 ft. 8 in., which brings all the parts within the range of normal reach and vision. Even a minimum aisle space of 30 in. will leave ample room for the removal or replacement of any cell. Each cell is intended to operate at a normal amperage of 250, requiring a little over $\frac{1}{10}$ kw. per hour. A battery of 1000 cells will occupy a space 4¼ x 31 ft. and is claimed to produce 200 cu.ft. of oxygen and 400 cu.ft. of hydrogen per hour.

Hand Versus Power Feeds

By Harry Senior

On page 356 of the *American Machinist* Arthur W. Suiter upholds the writer of a previous article who advocated the removal of power feeds from surface grinding machines. He also charges me with having reviewed the article in question with "thinly veiled sarcasm with some rather irrelevant remarks thrown in for good measure."

I had not intended sarcasm, veiled or otherwise, in reference to the removal of the feeds. That is a matter of individual convenience. If a foreman chooses to remove the mechanism so that no one can use power feeds either rightly or wrongly it is strictly his funeral, though it does seem a pity to put a useful and valuable accessory out of business simply because there are some jobs that can be handled to better advantage without it. It is perfectly easy both to feed and to traverse a grinding machine by hand and still leave the automatic feature instantly available.

My criticism was directed against the implied statement in the original article (page 901, Vol. 49) that

the feeds and power traverse (though this latter was not specifically mentioned) were removed because *the workmen did not know enough to use them properly.*

The point made by Mr. Suiter that a heavy cut slowly fed across the work is not good practice is not to be questioned, but the implication that this condition is the fault of the power feed and table drive is not warranted, as it is quite as easy to feed rapidly by power as by hand and much less fatiguing. On the other hand the depth of cut is quite independent of the method of feeding and traversing. If the operator is going to do it wrong anyway he can accomplish the latter result by hand as well as by power, and the incentive is much greater (in the estimation of a lazy or incompetent operator), as thereby he can save several miles of table travel in course of a year.

I do not dispute the statement that for grinding light, intricate parts hand feed (and traverse) is desirable, but I contend that this does not constitute a reason for dismantling the automatic feature any more than the fact that we frequently use hand tools or hand feeds on the lathe warrants the removal of the feed works from the latter. And when a foreman deliberately imposes an entirely unnecessary hardship upon all hands all the time simply because a part of his force for a part of the time misuses the conveniences provided to increase its efficiency there is something wrong with the foreman.

The toolmaker who through ignorance wrongly performs an operation so simple in principle as surface grinding is not yet a toolmaker, and a foreman who allows a toolmaker to do the same wilfully through carelessness or laziness is not a foreman.

I will advance as a "single legitimate reason" why power feeds and traverse should not be removed from grinding machines the fact that on jobs of any size the hand operation is tedious and fatiguing, resulting in prompt and noticeable depreciation of the operator's sense of touch and consequent ability to make fine measurements. It also—perhaps this is a separate reason—occupies *all* the operator's attention and both of his hands *all* the time, and good toolmakers do not spend all of the time that they have an automatic machine running in sucking their thumbs and cooling their heels.

There is still another reason against the proposition: Sandow himself could not maintain over long periods the absolute unvarying precision of movement that is characteristic of the automatic feature. Short and narrow pieces do not by any means constitute the major portion of tool work, and uniformity of feed and traverse is quite essential to good results.

Nothing can be done on the surface grinding machine stripped of its automatic movements that cannot be performed with equal advantage (without using them) with the latter in their proper place; nothing can be done without their use that cannot be done with it if desirable. If they are there they may be used or not at the discretion of the operator or his foreman; if they are not there they obviously cannot be used no matter how badly they are needed. We might as well discuss the abolishment of the railroads because some fellows get too fat riding around in Pullman cars.

Mr. Suiter suggests that omitting the automatic features of surface grinding machines would accomplish a saving in cost of construction. The cost of such a machine is slight in comparison with the value of its product and even a very minor reduction in its efficiency would soon swamp any saving in this direction, but if he wants them I think they may be obtained. I do not know who, if anybody, makes them now, but I have seen, operated and cursed them 30 years ago.

Specifications for Shop Oils

By M. H. Potter

The specifications given herewith are worthy of note from the standpoint of practical use. Many shops would do well to specify that the oils which they purchase come within certain limits. Simple tests which will enable the user to determine as to whether or not the purchased oils are within the specifications are here given.

This substitute may be used with satisfactory results for all purposes where neatsfoot oil has been used. The great scarcity of neatsfoot oil has made it quite difficult to obtain and the price is correspondingly high.

This mixture should be composed of 50 per cent. animal oil, the balance to be well-filtered mineral oil of approximately the same viscosity. The animal oil should be a good grade of lard or neatsfoot oil and should have a cold test not higher than 45 deg. F. which test may be carried out in the following manner:

A four-ounce sample bottle is half filled with the oil, a thermometer inserted in the neck of the bottle with the bulb in the oil, and the bottle placed in a freezing mixture. It is allowed to remain in this freezing mixture for one hour after the oil has solidified. The bottle is then removed and the frozen mass of oil carefully worked with the thermometer until the oil will flow from one end of the bottle to the other, the reading of the thermometer at this point is the cold test.

It is also important that the animal oil should not contain more than 4 per cent. of acid. The viscosity of the mineral oil used should be at least 300 at 70 deg. F. using a standard viscosimeter. The mineral oil should have a cold test below 25 deg. F.; oils having a lower cold test are more desirable. The flash point of the mineral oil (under open cup test) should not be less than 335 deg. F.

Lard oil should be free from all other oils and foreign matter and should contain less than 3 per cent. acid. It should have a specific gravity of 0.916 to 0.920 at a temperature of 60 deg. F.; it should show no discoloration under the regular laboratory test, and when heated should be free from offensive odors.

Good grades of tempering oils will pass the following prescribed specifications and tests:

Light Tempering Oil.—This oil should be free from acid; the flash test should not be less than 375 deg. F.; the oil should not congeal when cooled in a vial to 25 deg. F.; and should show a viscosity of not less than 130 at 100 deg. F., under the standard viscosimeter test.

Medium Tempering Oil.—Specifications and tests are the same as prescribed above with the following variations: The flash test (open cup) should not be less than 400 deg. F.; and the viscosity should show 270 at 100 deg. F. under the standard test.

Heavy Tempering Oil.—Specifications and tests are the same as prescribed for light tempering oils with the following variations: The flash test (open cup) should not be less than 590 deg. F.; the viscosity should show 170 to 190 at 212 deg. F.; and the oil should not congeal above 30 deg. F. when cooled.

US ARMY ORDNANCE NEWS

Hardness Tests of Gun-Barrel Steel

By WILLIAM KENT SHEPARD
Assistant Professor, Sheffield Scientific School, Yale University.

Confirmation of previous investigations into the relations between tensile and hardness tests on steel is furnished in this article. The results suggest a saving in the time required for making physical tests on gun barrels which might well be useful along other lines. The advantages of physical tests made on the actual product without resorting to the use of separate test specimens are obvious.

THIS paper is the report of a number of tests made in the Mason Laboratory of Mechanical Engineering at the Sheffield Scientific School of Yale University to see if the Brinell and scleroscope hardness tests on a certain grade of gun-barrel steel would give reliable indications of the physical properties of the steel as found by the ordinary tensile test.

Investigations by Robert R. Abbott on treated and untreated alloy and plain steels and by Shepard and Porter on cold-rolled steel have shown that an approximate straight-line relation exists between the ultimate tensile strength and the Brinell hardness number and the ultimate tensile strength and the scleroscope hardness number. The steels under investigation by the above authors varied greatly in ultimate strength, due to varying chemical composition, heat treatments and cold working.

It was believed by the author of the present article that with specimens of steel of practically the same chemical composition and differing in physical properties due only to variations in the heat treatment the hardness tests might give quite satisfactory indications of these physical properties.

A large number of tensile tests of gun-barrel steel were being made during the winter of 1917-18 at the Mason Laboratory for the Marlin-Rockwell Corporation of New Haven, Conn. This steel, which was being used in the Marlin aircraft and the light Browning rapid-fire guns, is commonly known as "smokeless-barrel steel" and has a chemical analysis of 0.50 to 0.60 per cent. carbon, 1.15 to 1.30 per cent. manganese, 0.18 to 0.25 per cent. silicon, 0.08 per cent. (maximum) phosphorus and 0.06 per cent. (maximum) sulphur. The physical specifications for this steel were 110,000 lb. per square inch (minimum) tensile strength, 75,000 lb. per square inch (minimum) yield point, 40 per cent. (minimum) reduction in area and 20 per cent. (minimum) elongation in 2 in. The opportunity thus pre-

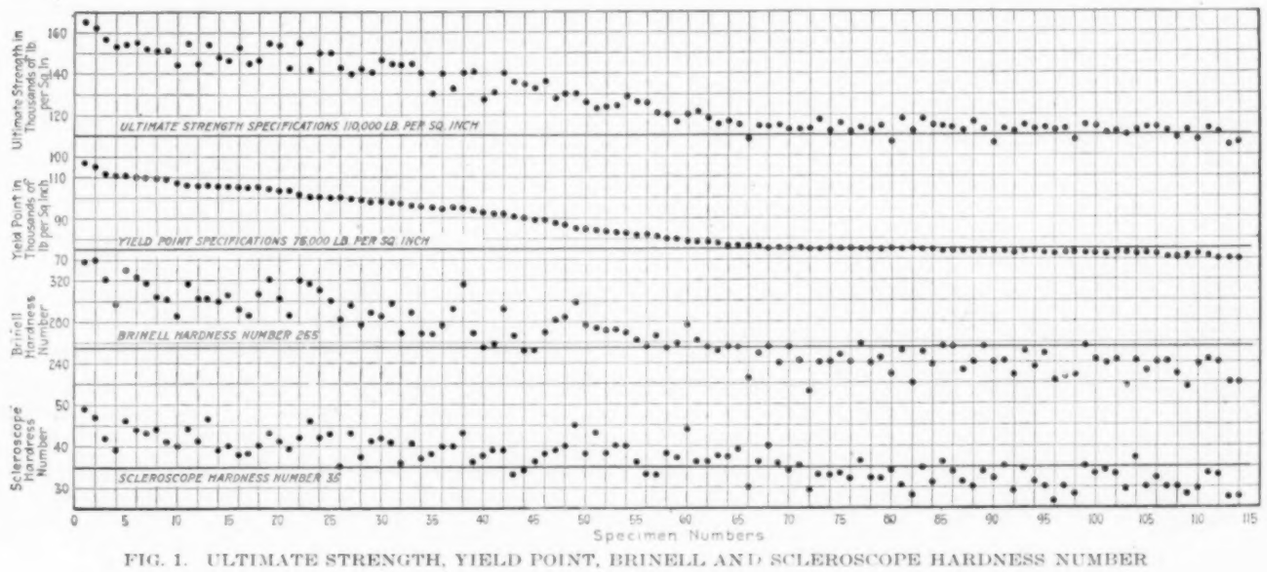

Ultimate Strength in Thousands of lb per Sq. In.
ULTIMATE STRENGTH SPECIFICATIONS 110,000 LB. PER SQ. INCH
Yield Point in Thousands of lb per Sq. Inch
YIELD POINT SPECIFICATIONS 75,000 LB. PER SQ. INCH
Brinell Hardness Number
BRINELL HARDNESS NUMBER 255
Scleroscope Hardness Number
SCLEROSCOPE HARDNESS NUMBER 35
Specimen Numbers

FIG. 1. ULTIMATE STRENGTH, YIELD POINT, BRINELL AND SCLEROSCOPE HARDNESS NUMBER

ARMY ORDNANCE NEWS

sented itself to make Brinell and scleroscope hardness tests in connection with the tensile tests on this one grade of steel.

A flat surface was ground on each gun barrel and this surface smoothed off with a fine file and emery cloth to remove the grinding-machine marks. A smooth surface was of course very necessary, as scratches interfered with the rebound of the scleroscope hammer and with a clear definition of the edge of the Brinell indentation.

The scleroscope hardness tests were made on this surface with the standard universal diamond-pointed hammer.

The Brinell hardness tests were then made on this surface with a 10-mm. (0.39-in.) steel ball and with both an instantaneous and 30-sec. load of 3000 kg. (6615 lb.). The diameters of the Brinell indentations were measured with a Bausch & Lomb microscope, which contained a 7-mm. scale graduated in tenths of a millimeter. This permitted a reading of the diameter to $\frac{1}{100}$ of a millimeter by estimation. The hardness numbers were found as usual by dividing the load of 3000 kg. by the spherical area of the impressions in square millimeters.

The tensile tests were made with the standard 0.505-in. diameter specimens on a 50,000-lb. Riehle universal testing machine. The yield point was found by the drop of the beam.

At the beginning of the investigation the ends of a number of the barrels, test specimens of which had shown results that failed to come up to the tensile specifications, were given the Brinell and scleroscope hardness tests as above described. After a large number of these hardness tests had been found to indicate quite closely the results of the tensile tests a number of the ends of the barrels, test specimens of which had given results that came within the tensile specifications, were also given the hardness tests.

The results of these tests are given in the table and shown graphically in Figs. 1 and 2.

Since the material showed cause for rejection due to the yield point being below specifications rather than the ultimate strength the results have been collected so as to show in Fig. 1, from left to right, a decreasing yield point. Each four points in the same vertical line show for the same specimen the ultimate strength, yield point, Brinell hardness number for instantaneous load and the scleroscope hardness number. Heavy horizontal lines have been drawn in this figure at 110,000 lb. per square inch ultimate strength (specifications). 75.000 lb. per square inch (specifications), 255 Brinell hardness number (Brinell diameter 3.80 mm.) and 35 scleroscope hardness number.

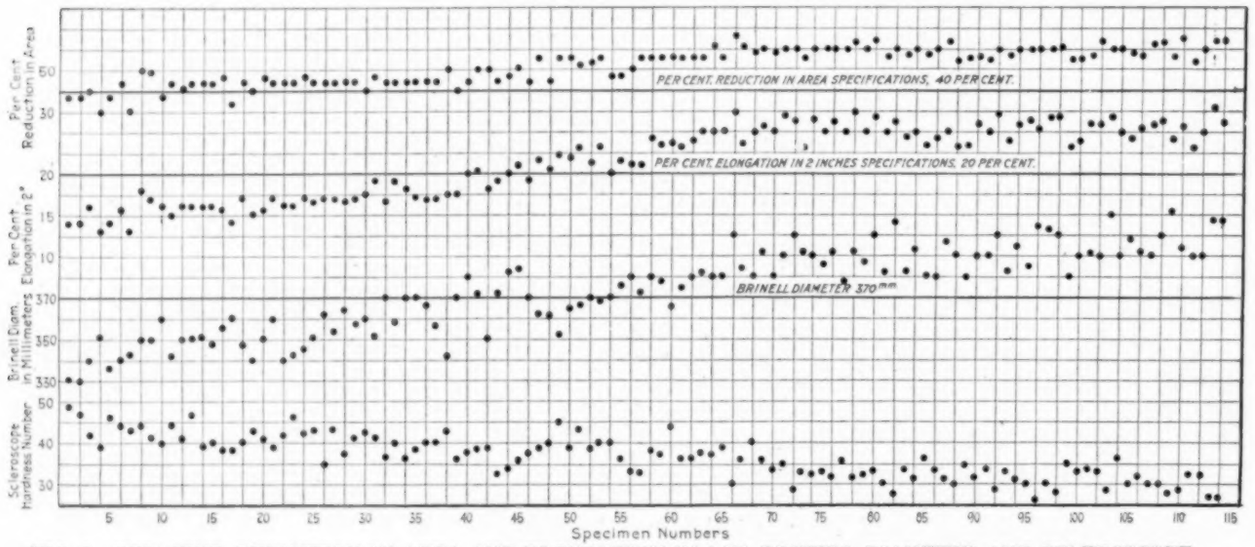

Per Cent. Reduction in Area
Per Cent. Elongation in 2"
Brinell Diam. in Millimeters
Scleroscope Hardness Number
PER CENT. REDUCTION IN AREA SPECIFICATIONS, 40 PER CENT.
PER CENT. ELONGATION IN 2 INCHES SPECIFICATIONS, 20 PER CENT.
BRINELL DIAMETER 370 mm.
Specimen Numbers

FIG. 2. PER CENT. REDUCTION IN AREA AND ELONGATION IN 2-IN. BRINELL DIAMETER AND SCLEROSCOPE HARDNESS NUMBER

In Fig. 2 the points from left to right represent the results for the specimens in the same order as in Fig. 1. However, in this figure each four points in the same vertical line give for the same specimen the per cent. reduction in area, per cent. elongation in 2 in., Brinell diameter for instantaneous load and scleroscope hardness number. Heavy horizontal lines have been drawn in this figure at 40 per cent. reduction in area (specifications), 20 per cent. elongation (specifications) and 3.70-mm. Brinell diameter (Brinell hardness number 269).

The Brinell hardness numbers or diameters for 30-sec. loads are not plotted in Figs. 1 or 2, since these results, as will be seen in the table, are practically the same as those for the instantaneous loads.

It is seen in Fig. 1, as would be expected, that the Brinell and scleroscope hardness numbers decrease with decreasing ultimate strength and yield point, and that as the values of the yield point begin to fall below the specifications value of 75,000 lb. per square inch the Brinell hardness number comes below about 255 (Brinell diameter 3.80 mm.) and the scleroscope hardness number below about 35.

ARMY ORDNANCE NEWS

An examination of Fig. 1 will show that if ultimate strength specifications had been 115,000 instead of 110,000 lb. per square inch the specimens which showed failure to attain yield-point specifications would also fail in respect to this ultimate strength specification.

In Fig. 2 the Brinell diameters have been plotted instead of the Brinell hardness numbers, as it could be anticipated that increasing per cent. reduction in area and increasing per cent. elongation would be followed by increasing diameter of the Brinell indentation.

It can be seen in this figure that for the specimens the elongation of which is below 20 per cent. the Brinell diameter is in most cases below 3.70 mm. (Brinell hardness number 269).

A further examination of Fig. 2 shows that the values of the per cent. reduction in area have the same trend as the values of the per cent. elongation and that a specification of 45 instead of 40 for the per cent. reduction in area would be in better agreement with the 20 per cent. elongation specification.

The results of the scleroscope hardness tests, as plotted in Fig. 2, fail to show clearly a hardness number above which the percentage elongation for the specimen falls regularly below the 20 per cent. elongation.

The results of the Brinell hardness tests made on the steel used in this investigation seem to show that for instantaneous loads a Brinell diameter greater than 3.80 mm. or a Brinell hardness number less than 255 indicates a yield point for the steel of less than 75,000 lb. per square inch, and for instantaneous loads a Brinell diameter less than 3.70 mm. or a Brinell hardness number greater than 269, an elongation of less than 20 per cent. in 2 in. Therefore for instantaneous loads a Brinell diameter between 3.70 and 3.80 mm. or a Brinell hardness number between 255 and 269 on a barrel made from this grade of steel indicates that the yield point is above 75,000 lb. per square inch and at the same time the elongation is greater than 20 per cent. in 2 in. Consequently the results come within the tensile-test specifications set for the steel.

It is evident that it would not be feasible to replace the tensile test by the Brinell hardness test. However, this investigation seems to show that a very fair indication of the results of the tensile test may be anticipated by a preliminary Brinell hardness test.

The Brinell hardness test has the advantage that it can be easily and quickly made and does not harm the

RESULTS OF TENSILE AND HARDNESS TESTS

No.	Yield Point Lb. per Sq.In.	Ultimate Strength, Lb. per Sq.In.	Per Cent. Reduction in Area	Per Cent. Elongation in 2 In.	Scleroscope Hardness No.	Brinell Diameter Inst. Load	Brinell Diameter 30-Sec. Load	Brinell Hardness No. Inst. Load	Brinell Hardness No. 30-Sec. Load
1	117,000	165,000	37.0	14.0	49	3.31	3.40	338	321
2	115,000	162,250	37.0	14.0	47	3.30	3.35	340	332
3	111,500	156,850	40.5	16.0	42	3.40	3.42	321	317
4	111,000	153,000	30.8	13.0	39	3.52	3.60	298	286
5	110,600	154,000	37.0	14.0	46	3.36	3.38	330	325
6	110,000	155,150	43.5	15.5	44	3.39	3.41	323	320
7	109,200	152,000	30.8	13.0	43	3.42	3.50	317	302
8	109,150	151,200	49.0	18.0	44	3.49	3.50	304	302
9	108,850	151,300	49.0	17.0	41	3.50	3.55	302	293
10	107,050	144,550	37.0	16.0	40	3.60	3.60	286	286
11	106,000	154,800	43.2	15.0	44	3.42	3.49	317	304
12	105,800	145,000	41.7	16.0	41	3.50	3.58	302	289
13	105,500	154,250	43.5	16.0	46	3.50	3.52	302	298
14	105,500	148,000	43.5	16.0	39	3.51	3.55	300	293
15	105,250	146,200	43.5	16.0	40	3.48	3.52	306	298
16	105,000	152,250	46.3	15.5	38	3.55	3.59	293	287
17	105,000	144,700	34.0	14.0	38	3.60	3.64	286	279
18	104,950	146,550	43.5	17.0	40	3.48	3.53	306	297
19	104,700	154,900	40.5	15.0	43	3.40	3.40	321	321
20	103,550	153,750	46.0	15.5	41	3.50	3.52	302	298
21	103,400	142,600	43.5	17.0	39	3.60	3.60	286	286
22	101,850	154,900	43.5	16.0	42	3.40	3.40	321	321
23	100,500	141,900	43.5	16.0	46	3.42	3.55	317	293
24	100,100	150,550	46.0	17.0	42	3.45	3.47	311	307
25	100,000	150,150	43.5	16.5	43	3.51	3.52	300	298
26	99,950	142,350	43.5	17.0	35	3.62	3.68	282	272
27	99,150	139,250	43.5	17.0	43	3.53	3.60	296	286
28	98,900	142,100	43.7	16.5	37	3.65	3.70	277	269
29	97,950	140,500	43.5	17.0	41	3.58	3.61	289	284
30	98,000	146,200	40.5	17.5	42	3.60	3.62	286	282
31	97,750	144,750	46.0	19.0	41	3.52	3.52	298	298
32	97,000	144,200	43.5	16.5	36	3.70	3.70	269	269

RESULTS OF TENSILE AND HARDNESS TESTS

No.	Yield Point Lb. per Sq.In.	Ultimate Strength, Lb. per Sq.In.	Per Cent. Reduction in Area	Per Cent. Elongation in 2 In.	Scleroscope Hardness No.	Brinell Diameter Inst. Load	Brinell Diameter 30-Sec. Load	Brinell Hardness No. Inst. Load	Brinell Hardness No. 30-Sec. Load
33	96,000	144,800	43.5	19.0	40	3.58	3.60	289	286
34	95,850	140,400	43.5	18.0	37	3.70	3.70	269	269
35	95,000	130,300	43.5	17.0	38	3.70	3.75	269	262
36	94,700	139,800	43.5	17.0	39	3.65	3.65	277	277
37	94,250	132,700	43.5	17.0	40	3.56	3.58	292	289
38	94,300	139,350	49.0	17.0	43	3.43	3.50	315	302
39	93,650	140,300	40.5	17.5	36	3.70	3.71	269	268
40	92,150	127,300	43.5	20.0	37	3.80	3.78	255	258
41	91,400	130,750	49.0	20.5	39	3.72	3.72	266	266
42	91,250	139,600	49.0	18.0	39	3.50	3.55	302	293
43	90,400	135,750	43.5	19.0	33	3.72	3.75	266	262
44	90,000	134,500	46.0	20.0	34	3.82	3.82	252	252
45	88,900	132,700	49.0	21.0	36	3.82	3.83	252	251
46	88,700	135,650	43.5	19.0	38	3.70	3.72	269	266
47	87,800	127,850	54.5	21.5	39	3.62	3.62	282	282
48	86,250	129,050	43.5	20.5	40	3.61	3.65	284	277
49	84,750	129,400	54.5	22.0	43	3.52	3.55	298	293
50	84,400	125,350	54.5	22.0	38	3.65	3.68	277	272
51	83,750	122,600	52.0	23.0	43	3.67	3.70	274	269
52	83,050	123,500	52.0	21.0	38	3.69	3.71	271	268
53	82,850	123,900	54.5	23.0	40	3.68	3.70	272	269
54	82,700	128,600	46.0	20.0	40	3.71	3.73	268	265
55	81,550	126,000	46.0	21.0	36	3.75	3.79	262	256
56	81,350	125,950	49.0	21.0	33	3.80	3.80	255	255
57	80,650	120,900	54.5	21.0	33	3.73	3.78	265	258
58	79,650	119,750	54.5	24.0	38	3.81	3.81	254	254
59	79,300	117,000	54.5	23.5	37	3.78	3.80	258	255
60	78,550	120,250	54.5	23.5	44	3.65	3.70	277	269
61	78,300	121,150	54.5	23.0	36	3.75	3.76	262	261
62	78,300	118,400	54.5	24.0	36	3.80	3.80	255	255
63	77,200	115,150	54.5	25.0	37	3.82	3.85	252	248
64	76,850	116,400	60.0	25.0	37	3.80	3.80	255	255
65	76,350	114,900	54.5	25.0	39	3.80	3.77	255	259
66	76,100	108,600	64.5	27.0	30	4.03	4.03	225	225
67	75,750	114,500	60.0	23.5	36	3.84	3.90	249	241
68	75,500	114,000	57.0	24.5	40	3.80	3.80	255	255
69	75,350	114,300	60.0	25.5	35	3.92	3.90	239	241
70	75,000	112,750	57.0	25.0	34	3.80	3.82	255	252
71	75,000	112,350	60.0	27.0	35	3.90	3.92	241	239
72	74,900	112,750	60.0	26.0	29	4.15	4.11	212	216
73	74,850	116,950	54.5	23.0	33	3.92	3.90	239	241
74	74,550	111,650	60.0	26.5	33	3.90	3.92	241	239
75	74,300	115,200	60.0	25.0	33	3.86	3.84	247	249
76	74,300	111,250	60.0	26.0	32	3.92	3.95	239	235
77	74,250	113,450	60.0	25.0	36	3.78	3.80	258	255
78	74,250	111,600	64.5	27.0	32	3.92	3.92	239	239
79	74,200	114,300	60.0	25.0	32	3.88	3.88	244	244
80	74,200	106,100	64.5	27.0	34	4.00	4.00	228	228
81	74,150	117,600	57.0	24.5	30	3.82	3.82	252	252
82	74,050	111,850	60.0	26.0	28	4.07	4.05	221	223
83	74,000	117,250	57.0	24.5	34	3.82	3.82	252	252
84	73,800	114,500	60.0	25.0	31	3.93	3.97	237	232
85	73,800	113,600	57.0	23.5	36	3.81	3.89	254	242
86	73,650	113,500	60.0	24.0	34	3.80	3.80	255	255
87	73,650	111,850	64.5	25.0	31	3.97	3.97	232	232
88	73,500	116,150	54.5	23.0	30	3.90	3.90	241	241
89	73,500	112,800	54.5	23.0	34	3.80	3.79	255	256
90	73,400	115,950	57.0	26.0	32	3.90	3.90	241	241
91	73,400	112,400	54.5	25.0	35	3.90	3.90	241	241
92	73,400	111,650	60.0	27.0	29	4.00	4.00	228	228
93	73,350	114,250	57.0	24.0	34	3.83	3.84	251	249
94	73,350	112,600	60.0	26.0	31	3.95	3.95	235	235
95	73,200	112,550	60.0	26.5	30	3.85	3.90	248	241
96	73,200	111,950	60.0	25.5	26	4.05	4.05	223	223
97	73,000	112,500	60.0	27.0	30	4.03	4.00	225	228
98	73,000	107,800	60.0	26.5	28	4.01	4.02	227	226
99	72,900	114,200	54.7	23.0	35	3.80	3.82	255	252
100	72,900	113,550	54.5	23.5	33	3.89	3.91	247	240
101	72,900	110,900	57.0	26.0	34	3.92	3.98	239	231
102	72,850	111,150	62.5	26.0	33	3.90	3.90	241	241
103	74,200	114,300	60.0	25.0	32	3.88	3.88	244	244
104	72,700	112,000	60.0	25.0	37	3.90	3.91	241	240
105	72,600	113,250	57.0	24.0	30	3.98	3.98	231	231
106	72,050	113,150	57.0	25.5	32	3.92	3.91	239	240
107	71,850	111,750	62.5	26.0	30	3.90	3.90	241	241
108	71,800	108,750	62.5	26.5	29	4.00	4.00	228	228
109	71,750	111,350	57.0	24.5	28	4.12	4.12	215	215
110	71,450	107,650	64.5	25.5	29	3.94	3.95	236	235
111	71,000	111,950	54.5	23.0	33	3.90	3.92	241	239
112	70,700	110,500	60.0	25.0	33	3.90	3.93	241	241
113	69,615	104,400	64.5	28.0	27	4.08	4.08	219	219
114	69,550	105,350	64.5	26.5	27	4.08	4.10	219	217

ARMY ORDNANCE NEWS

barrels for further use. A Brinell test can be made on every barrel and the results will indicate the barrels which are too hard or too soft to come within the limits set for the tensile test.

Brinell tests made on a few barrels chosen at random from a certain group of heat-treated barrels will often show the necessity of a further heat treatment before submitting any of them to the tensile test.

Abstracts of Recent Office Orders of General Interest

No. 605, Mar. 25. The following officers are designated as survey officers in the district ordnance offices: Maj. R. E. Friend, Boston District Office; Capt. A. J. Hudson, New York District Office; Capt. J. H. Hersey, Rochester District Office; Lieut. Sol Harrison, Bridgeport District Office.

No. 607, Mar. 26. The following officers are designated as survey officers in the district ordnance offices: Capt. A. E. Miller, Detroit District Office; Capt. John H. Casey, Cleveland District Office; Second Lieut. C. A. McMullen, St. Louis District Office.

No. 607, Mar. 26. First Lieut. H. C. Davis is designated survey officer for the claims board at the Watervliet Arsenal.

No. 609, Mar. 27. James W. Lyons is appointed acting ordnance district chief, Chicago District, and temporary chairman of the Chicago District Claims Board during the absence of E. A. Russell.

PERSONALS

First Lieut. Roy S. Bridge, lately discharged, is a graduate of Pratt Institute. He has been on duty in Washington. The home of Lieutenant Bridge is at 154 South St., Pittsfield, Mass.

* * *

First Lieut. Walter O'Brien, of Juneau, Alaska, who is a graduate of Massachusetts Institute of Technology, was discharged on his return from abroad. He was formerly manager of the Sullivan Machinery Co., in Alaska.

* * *

Maj. M. M. Hopkins, a graduate of George Washington University, and formerly director of the Engineering Institute of Industrial Research, Washington, D. C., has been discharged. His home address is at Edgemoore, Md.

* * *

Second Lieut. Walter L. Brady has been discharged. He is a graduate of St. Louis University and was previously connected with the St. Louis Frog and Switch Co., and also the United Railways Co., both of St. Louis, Mo.

* * *

Second Lieut. Pliny A. Porter, Berlin, Wis., who enlisted in March, 1918, and was commissioned in August, 1918, has been discharged. He attended Beloit College and was afterward employed by the Fairbanks-Morse Co., Beloit, Wis.

First Lieut. M. F. Roche, who is a graduate of the Pratt Institute, Brooklyn, N. Y., has been discharged. Previous to his being commissioned, he was employed by the Barrett Co., as chemical and mechanical engineer at 17 Battery Place, New York.

* * *

First Lieut. L. A. Weed, who was commissioned in August, 1915, has been discharged. He is a graduate of Harvard and was formerly employed by Browning & Co., importers, New York. Lieutenant Weed's home is at 117 Berkley Place, Brooklyn, N. Y.

* * *

Capt. Carl A. Strand, who was commissioned in November, 1917, and served with the Production Division, has been discharged. Captain Strand's home is at Highland Park, Mich., and before entering the service he was president of C. A. Strand Co. of that city.

* * *

Second Lieut. Gilbert Chandler, Jr., has left the service. He is a graduate of Drexel Institute and entered the service as an enlisted man. Lieutenant Chandler, Jr., was formerly employed by the Massachusetts Bonding and Insurance Co., Saginaw, Mich.

* * *

Capt. Robert E. Briggs, who was recently discharged, was commissioned first lieutenant in November, 1917. He is a textile engineer, and a former student at Wesleyan University. Captain Briggs has been on duty in the Supply and Engineering Divisions.

* * *

First Lieut. Alfred H. Lawson, who was commissioned second lieutenant in January, 1918, and has been on duty in the Supply Division, has returned to civil life. He is a graduate of Georgetown University, and was treasurer of the District Insurance Co., Washington.

* * *

First Lieut. William A. Stoll, who enlisted in June, 1917, and was commissioned second lieutenant in April, 1918, has been discharged at Camp MacArthur. He entered the service immediately after graduating from the University of Pennsylvania. His home is at 2535 Cherokee Parkway, Louisville, Ky.

* * *

Capt. T. E. Raymond, of 84 Ellery St., Cambridge, Mass., who was commissioned first lieutenant in April, 1917, is a graduate of Massachusetts Institute of Technology. Before he came into the service he was instructor in machine design at Michigan Institute of Technology.

* * *

First Lieut. Ira E. Gillen, of Cleveland, Ohio, who was commissioned in October, 1917, and went overseas in December, the same year, was discharged on his return. His work overseas has been in connection with the repair of ordnance material. Lieutenant Gillen is a graduate of the Culver Military Academy.

* * *

First Lieut. H. A. Estabrook, whose home is at 645 Superior Ave., Dayton, Ohio, has been discharged after 16 months' service. He served in the Engineering Division in Washington and was overseas for nearly 10 months. Lieutenant Estabrook is a graduate of Ohio State University and was formerly manager of the Whitehall Paper Mills, Whitehall, Md.

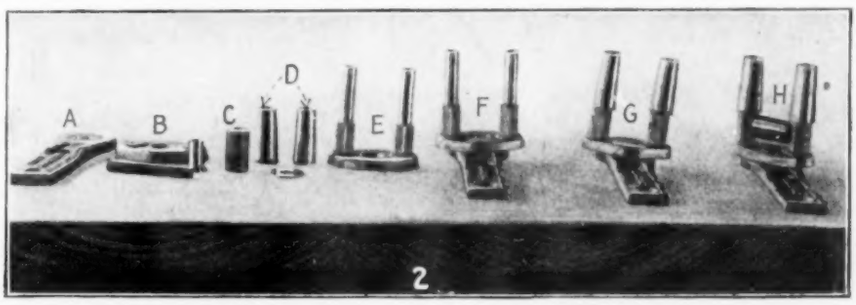
Manufacturing a Safety Belt Shifter

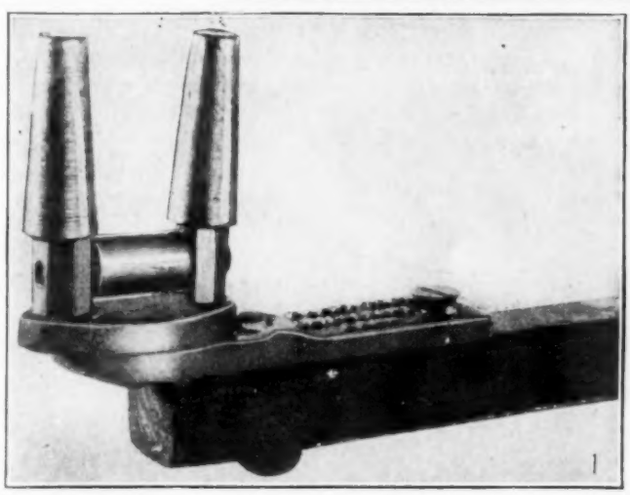
By ROBERT MAWSON

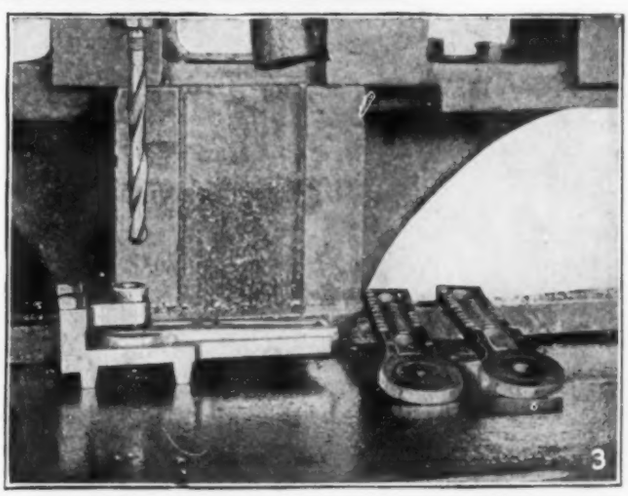
A few of the jigs used in the manufacture of a belt shifter are here shown. While these jigs are comparatively simple they contain some features applicable to other work.

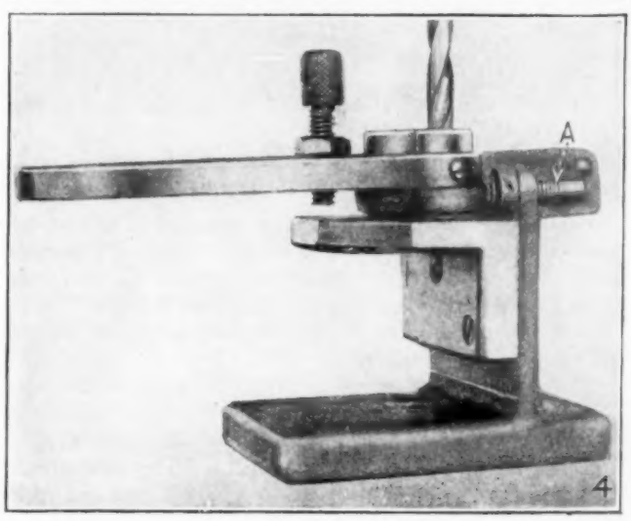
THE tendency now as never before is to provide safety means and devices for various operations in the machine shop. Belt shifting is a common operation in a shop, and to make it as safe as possible a safety belt shifter has been developed by the Ready Tool Co., Bridgeport, Conn., which is known as the "Safety First" belt stick. All are familiar with the two methods commonly used to put a belt on a pulley. The first is to put it on by hand and the second to use a stick at the end of which a pin, or bolt, is attached. Both of these methods are more or less dangerous.

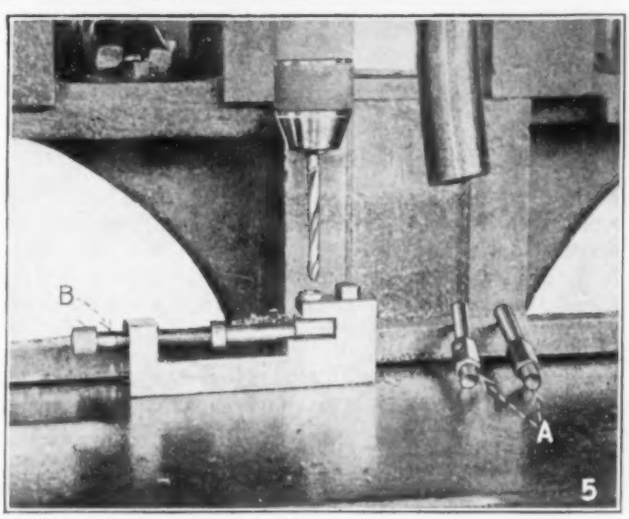
A safety belt shifter attached to a stick ready for service is shown in Fig. 1. It will be seen that the shifting mechanism consists of three rollers, one straight and two tapered. The belt is pushed by means of the straight roller, and owing to the shape of the taper rollers the tendency is for the belt to slide onto the pulley as the shifter slides away. Various shifter parts are shown in Fig. 2. *A* is a base; *B* a plate casting and *C* and *D* are straight and tapered rollers. At *E*, *F*, *G* and *H* are shown various stages of assembling.











FIGS. 1 TO 5. BELT-SHIFTER PARTS AND JIGS

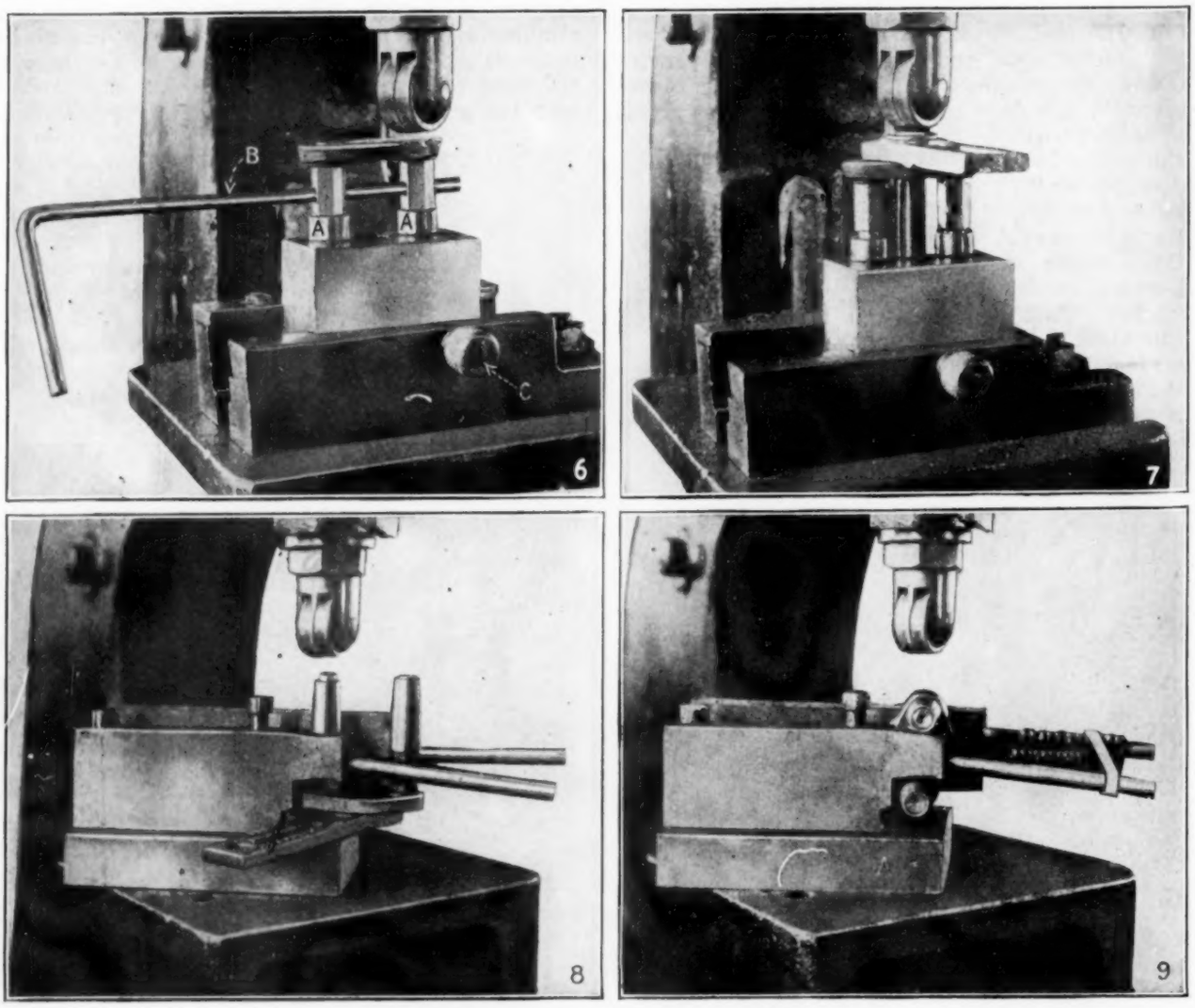
Fig. 1—Complete safety belt shifter. Fig. 2—Shifter parts and stages of assembly. Fig. 3—Drilling the base. Fig 4—Drilling the plate casting. Fig. 5—Drilling the roller studs

The operation of drilling the base is shown in Fig. 3. The rough casting is located in a contoured recess which is approximately the shape of the piece. After it has been pushed into this recess, the operator holds the casting and drills the center hole. Castings before and after drilling are shown to the right of the jig.

The jig used for drilling the plate casting is illustrated in Fig. 4. The piece is placed on a pin which fits into the cored hole, the hinged cover of the jig being thrown back to allow for this operation. The casting is located by two adjusting screws like *A*, one

riveting the studs into the plate casting, and is shown in Fig. 6. The studs are placed in bushings *A* resting on the turned shoulders. The bar *B* is then placed through the drilled holes to hold the posts in the correct alignment. After the plate has been placed over the turned ends of the posts, as shown, the ends are riveted until they are held firmly in position. The studs are located in turn under the spindle of the Grant riveter by means of the index pin *C*.

The plate casting is next riveted to the base as shown in Fig. 7. The two posts are again dropped in-



FIGS 6 TO 9. VARIOUS RIVETING JIGS

Fig. 6—Riveting the studs into the plate. Fig. 7—Riveting the base to the plate. Fig. 8—Riveting on the rollers. Fig. 9—Riveting pin for center roller

against each boss of the piece. The jig cover is then dropped down and two holes drilled in the part. The post, or studs, on which the tapered rollers fit are made from hexagonal steel, the first operation being turning a certain distance on each end.

The studs are drilled as shown in Fig. 5. It will be noticed from the two studs at *A* that the ends are turned so as to form a shoulder. The stud is placed on a V-block in the jig with the turned end in a recess. The stud shoulder is then forced solidly against the end of the jig by means of the screw *B*. By this means the distance from the hole drilled to the shoulder is always the same.

When assembling the parts the first operation is to bushings and the short pin rests on a center post as shown. It will be noticed that the side posts do not rest on their respective shoulders. This insures the two parts being rigidly fastened together before there is any danger of the shoulders resting against the top of the bushings.

The next operation is riveting the ends of the studs so as to hold on the tapered rollers. The rollers are placed on their respective studs and the casting placed on the fixture as shown in Fig. 8. The end of each stud is then riveted over enough to prevent the rollers falling off, yet free enough for them to turn as desired.

The last operation is riveting the pin which passes through the center straight roller. The roller and pin

are placed in position and the shifter held on the fixture as shown in Fig. 9. The lower end of the pin rests on the surface of the fixture at *A* so as to provide firm support during the operation. One end of the pin is riveted over, then the shifter turned over and the other end riveted until the pin and roller are secure between the side posts. The roller is, however, a trifle shorter than the distance between the posts, so that it will turn freely on the pin. The device is now completed and ready to attach to a belt pole.

Keeping Track of Production

By HENRY A. NOAR
Manager, Efficiency Devices Co., Detroit, Mich.

Almost everybody has tried his hand at devising systems for keeping track of jobs or men or tools, and has probably felt that his system was a pretty good one until its wires got crossed with those of somebody else's method. The devices described here are designed to simplify this problem by providing uniform methods throughout the plant and are the result of a combination of ideas taken from all over the country.

THERE was a time not so many years ago, when the subjects of planning and production, routing and dispatch were of secondary importance. When plants were small the superintendent, his assistant, or the department heads could generally see to it that the different parts making up a unit came to assembly at a given time. With the growth of large plants, this personal supervision became not only impracticable but an utter impossibility. Where a plant employing thousands of men figures on production of

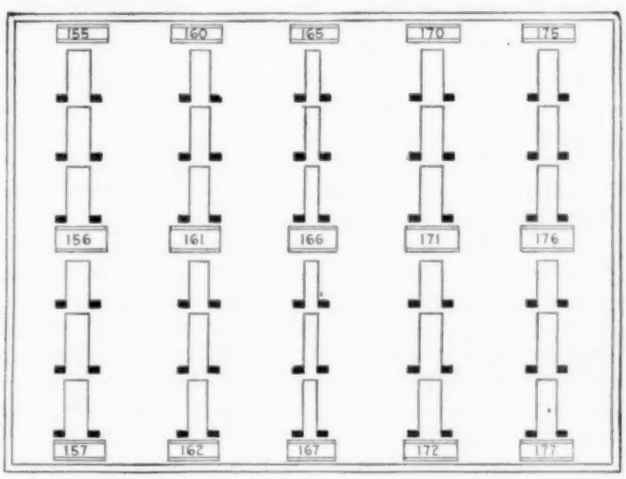


FIG. 1. BOARD WITH SPRING CLIPS IN GROUPS OF THREE

FIG. 2. CONTROL BOARD WITH FELT-COVERED STRIPS

400 automobiles per day, the subject of keeping all parts moving on schedule becomes one of utmost importance, for if one department drops behind in its production, it means a jam in the final assembly and the piling up of unfinished units waiting for the slow part. Such a condition may become so serious as to close down all other departments. The financial problem also enters, as unfinished units piled up soon tie up the working capital usually needed to meet the payroll and incoming material expenses.

The problem then is to keep the required number of parts coming on schedule so that the product of the plant flows out in an even stream with just the proper number of men to work up the material and transportation to move it. If equipment of any kind is being sent to a distant point to be erected, it is necessary that this equipment come through on schedule so as to reach the erecting point on time. Otherwise the expense of an idle erecting crew will soon eat up all the visible profits.

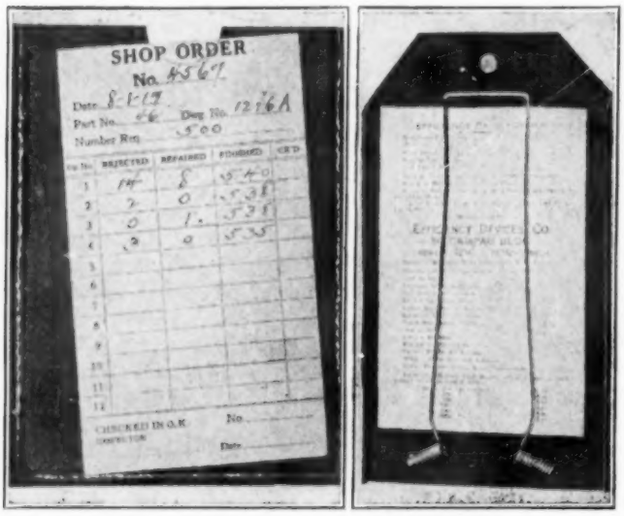
The need arises for some system to keep tab on both workmen and material so that data are available on short notice and the production of any department can be kept at its proper percentage of output. The use of devices of various sorts grew with the plant. One man installed a system of pins on the wall on which he hung tickets and kept them moving on the pins. This later required tickets of different colors to record different data. Another installed pockets of wood or metal for holding the job or stock tickets. Another used a large sheet or blotter and with pencil and eraser kept tab on his department. Each selected what seemed best for his own needs and each worked out his own ideas. Out of this maze of different ideas grew the demand for some standard line of equipment that would meet the pressing call of the efficiency and production engineers. This led the Efficiency Devices Co. of Detroit to make a specialty of building devices to meet this need.

One of the earliest appliances was the spring clip which consisted of a double-torsion spring attached to metal wings swinging on pivots, the clips being on both sides of the wing, or on one side only to be attached permanently to the wall. While standard sizes are usually made in convenient multiples, there is no limit to the size or arrangement of the cards or the size of the metal wings, except that of safety and convenience of handling. The greater demand for special groupings has been for groups of three; for jobs unassigned

or for which tools and drawings are not ready; jobs assigned for which tools and drawings are ready; and jobs in process, Fig. 1.

These spring clips will hold a bunch of cards or slips up to ⅜ in. thick so that the ordinary assignments can be taken care of and the ease of moving and replacing tickets makes this device one readily adapted to any shop. It can be applied as well to handling bonus tickets, stock cards, material records, perpetual inventory, shipping orders and other records which must be kept up to date and often referred to. The same clips are also used on separate card carriers or travelers, which can be attached to the machine, bench or truck, or carried by the workman.

The use of pocket cases much like those built by the manufacturers of time clocks is also quite general.



FIGS. 3 AND 4. CARD HOLDERS

Fig. 3—Flexible card traveler with celluloid face. Fig. 4—Steel card traveler for bins, boxes, etc.

An installation of a number of these units was made in a plant where wall space, to hang the required number of racks, was not to be had. To overcome this difficulty the racks were placed back to back, two units thus forming a wing with pockets on each face. Five of these wings were hung in pivot brackets against the wall spaced 6 in. apart. When opened full to either end they required a wall space of 7 ft. and when closed against the wall extended out only 15 in. Each rack was 2½ ft. wide and the 10 of them if placed flat would have taken 25 ft. of wall space. By this method of converting them into swinging wings they were crowded into a space of only 7 ft.

A Control Board Device

Another device is a control board, Fig. 2, having a number of felt-covered strips running across it and fitting close together so that the spaces between them form a padded slot. Ticket or tab holders in various sizes are made with the upper and lower edges turned over so that the tickets slip under these edges. A spur is welded to the back and this spur inserted and held in the padded slot. The tab holder with the ticket can then be shifted from one position to another as required.

A similar appliance consists of a board of cork-padded insert with ribbons on spring reels at the left side. As progress is made the ribbons are drawn across from left to right and held at any point by a pin in the cork insert. The ribbon reels are self-releasing and keep the ribbons tight on the surface of the board. The cork insert is self-filling so that the constant pricking with pins does not mar the surface. The top and bottom edges of the frame can be laid off to scale or by numbers so that the ribbons indicate percentage of production or quantity to date.

Demand for Bulletin or Tally Boards

A demand has also arisen for bulletin or tally boards. Plain steel wings with either a slate or japan finish, and soft wood wings with natural wood or slate finish or covered with burlap, can be made in different sizes to attach permanently to the wall allowing the use of one side, or swung on pivot brackets with or without cabinets. Where data or instructions are changing the

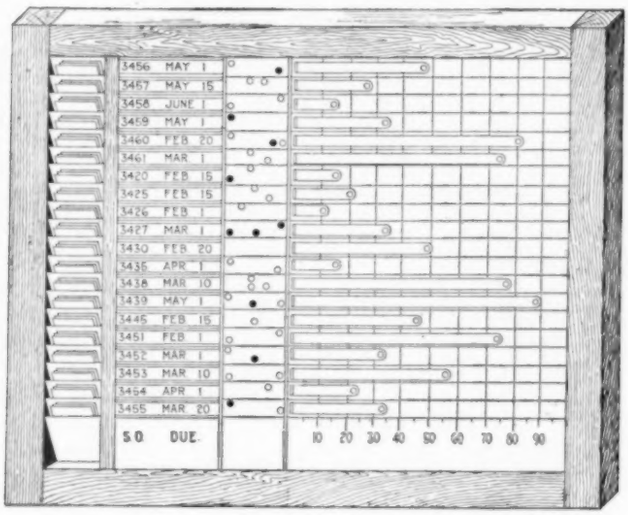


FIG. 5. COMBINATION CONTROL BOARD

slate finish allows the use of chalk tally, while if written bulletins or instructions are to be posted the soft wings permit the use of thumb tacks. Where formulas or prints are to be kept readily accessible and yet of a semi-private nature the swinging wings can be inclosed in a cabinet under lock and key.

One of the problems in repair work or work of a nature where special instruction cards are issued, is to keep those cards clean while in the shop. Handling by the workmen whose fingers are seldom spotless soon renders the instruction cards almost unintelligible and costly errors may then occur through the inability to read the card. Card travelers for cards, blueprints, drawings and instruction sheets have a transparent celluloid front with a leatherette or celluloid back, Fig. 3. An eyelet at the top allows the traveler to be hung up or tied to the job under way. The same idea is carried in a wall-chart holder, which is made ½ in. deep so that charts or reports as they accumulate can be dropped in, the last one in front of the others and fully visible.

Another question often arising in a plant is where to get metal tab, ticket, or card holders for stock bins, shelvings, tote boxes and the like, and several styles have been designed to fit these requirements, Fig. 4.

A number of interesting combinations have recently been worked out and Fig. 5 shows a combination of four styles. The first section is of pockets to hold material and work cards; the second section is a long tab holder to hold the order number and description;

the third section is of cork insert on which different colored pins can be used to denote different data; and the last section has movable ribbons on the cork insert to register percentage of progress. To this may be added a section of movable tab holders on felt pads to denote progress of different elements or units entering into the final assembly.

The subject of routing, planning and dispatch for the control of production will continue to grow as methods and equipment become standardized and more familiar to those who can use them to good advantage.

A Plea for Coöperation

By W. O. Adams

A man came to me not long ago with the statement that with wages as he believed they would be and peacetime competition again in full swing, his margin would be so reduced that his business must fail. His story developed the fact that he had previously been able to get his labor cheaply and had counted upon this factor almost exclusively to enable him to sell his goods at a fair profit against competition. Now he must pay more and he was up against it.

He was overlooking several factors. He believed that the money paid his operatives represented the true value of what they could do under any conditions. If his operatives did what they were assigned to do in the making of his goods and he attended to disposing of the goods at a profit, he had little interest in what happened to the men and felt that they had no rightful interest in what he did with his business or the goods that he paid them to produce.

Of course he was absolutely wrong. He had not reached the point where he could differentiate between legal ownership and coöperative interest. We must have legal ownership vested in some definite form and in this sense the plant, materials, equipment and the type of brain power necessary to make a coördinated whole was his.

Employees Share in Coöperative Interest

But his employees also shared in the coöperative interest for their capital of time and ability had entered into the value of the equipment and the goods. The operative had his problems to solve just as did the employer and he worked them out in a very similar way. In other words, here was one man and a group of men actually working towards the same end but forced by a misconception of their particular functions to carry on blindly without mutual understanding.

It developed that this employer had much to learn as to efficiency of operations and economical handling of his product. It had become necessary for him to install such improvements of production as would enable him to meet competition in spite of a higher labor rate. The details of his changes in methods are not important for they apply with one exception, to his particular business only. But that one exception is of the highest importance, for once his eyes were opened to the new order of things, he began at the base of his structure—with the human element—with the worker.

One seldom meets a business man who is not classed as a pretty good sort of fellow when off duty among his social acquaintances. He goes fifty-fifty with them, as he must, to make good. His employees do just about the same among their friends. They live, in proportion to their means, along very similar lines with similar hopes, emotions and sorrows. But in far too many cases the passing through the factory door throws both employer and employee into that atmosphere mysteriously described as "business" where the understanding and friendship of the outside are smothered by the attitude of worker and worked-for on the inside.

Your operative is glad to be called a worker provided he knows what he is working for and feels that he has a vital share in the rewards that come from intelligent work. He appreciates ability of supervision and respects just authority.

There is in most men an inborn desire to be loyal. But loyalty cannot be bought by wages. It is the flower of its surroundings. We all know many men who believe that system and efficiency go hand in hand. They do not believe it unless there is loyalty as a base. There lies the greatest of fundamentals in creating efficiency and for meeting the conditions of the future.

The old "rough-neck" methods are gone but their passing does not mean that coddling must take their place. Strong medicine suits strong men but it must be the right kind of strong medicine. Draw your men; do not drive them; give to them all your business will stand in fairness to yourself and to them and make them feel that you have an interest in them.

Cutting Threads of Unusual Pitch

By Wm. A. Frank

Upon reading the article by Miles C. Smith entitled "Cutting Threads of Unusual Pitch" on page 451 of the *American Machinist*, I was reminded of an attempt to make a conical worm by setting the mandrel on offset centers and threading. The result was an absolute failure and the condition which brought about this result is present in, and will render impractical, the method described by Mr. Smith for turning straight threads with the taper attachment set parallel to the center line of the work.

By this method the headstock center becomes a universal joint and the faceplate slot or driving stud is the driving pin of the joint. The variation in angular velocity of the driven member with a universal joint is well known, and this variation of angular velocity of the work relative to the lathe spindle and lead screw is the cause of all the trouble, for the lathe carriage and consequently the thread tool is alternately in advance of and behind its true pitch position. Of course this is more noticeable in cases requiring a large angle between the center line of the lathe spindle and the center line of the work, but the difference in the error introduced is one of degree, no matter how small the angle. This method, less Mr. Smith's trigonometric analysis, has been described before, but I do not believe it is used by those whom he calls "wide awake."

The only way I know of to apply this method is to fix a fine-tooth bevel gear to the faceplate and another to the work, having them mesh on the back of the lathe and thus drive the work with the same relative velocity as the spindle. This involves however more trouble that the method Mr. Smith rejects, viz: that of cutting special gears to meet the requirement.

If Mr. Smith desires a "perfect thread," I should advise the use of his method along the line of the doctor's directions for the use of cucumbers: "Pare them very thick, slice them very thin, soak them in salt for six hours, then throw them in the garbage."

Mechanical Hands and Arms

BY J. A. LUCAS

The mechanical devices shown, which are used by returned fighting men and others who have lost hands or arms, represent the latest developments.

The clamps and hooks are used for numerous purposes, while the sockets or sleeves may be used to hold hammers, files or wrenches.

These photographs were obtained through the courtesy of Chief of Re-Education, Louis Rouillion, of the Red Cross Institute for Crippled and Disabled Men, 311 Fourth Ave., New York.

The Modern Foreman—His Job

By M. L. LOWREY

Much has been said of the duties of the modern foreman, and it is apparent that diverse views obtain as to just what these duties comprise. The very diversity of conditions under which these men labor would however seem to make a comprehensive definition impractical. Mr. Lowrey does not attempt to make a definite statement; he merely tells in a very entertaining manner what had happened "at the close of one sad day."

THE articles on the modern foreman appearing in recent issues of the *American Machinist* have greatly interested me. They apparently have been written by men who employ foremen in large, well-conducted shops where the foremen seem to have lost their identity. I want to tell something of the foreman of a Western contract shop, what his duties are, what he must know and what the worries and annoyances are to which he is subjected.

To begin he must be an enthusiast in his trade, ready to shoulder responsibilities and make sacrifices for love of the game, as the little extra he gets does not begin to compensate him for the additional burdens he is called upon to assume.

His work comprises managing the shop and the proprietor, getting out the work without proper tools, collecting bills and keeping peace with the men, who are continually demanding more pay and better working conditions; in this he is "between the devil and the deep sea," for the proprietor is as continually trying to cut down expenses and do the work with cheaper help. The shop of which I write was a small jobbing shop located amid the mountain scenery of a far Western mining town. Everything was fish that came to our net; no job was turned away. We repaired dental instruments and plows; built mining machinery, sawmills and Patent Office models, set up engines and pumps; and once we turned a barber's pole and cut spiral lines upon it to guide the painter. I wonder how many machinists know whether such a spiral is right or left hand? I did not until the question came up on this job.

The day I have chosen to tell about was on the whole no worse than other days, as while there might have been a little extra trouble in some ways many of the regular troubles did not materialize. No one asked for more pay, nobody was sulky or impertinent, and the proprietor was at home sick and could not suggest that I use more boys and fewer men nor tell me of the wonderful bargain he had found in a junk yard in the way of a planer that "with a little fixing up would be as good as new." Further I had but one dispute with a customer about his bills, so I size it up as a fair-average day.

Like many other blue Mondays this day began on Saturday afternoon, which was also pay day. The time was midwinter and a big storm was brewing. Our big job at this time was the building of a double Corliss engine with 16-in. cylinders, and it pushed our resources to the extreme limit; but as work was none too plentiful I had told the proprietor we could handle it, although I realized that it would take lots of hard study on my part to design ways and means for doing it with the equipment at my disposal.

We needed one more good lathe hand, so when on this blustering Saturday afternoon a man applied for work and in answer to my question told me that he had grown up in the Corliss-engine business and had worked in some of the best shops in the Middle West I hired him and told him to report for work Monday morning.

The next day (Sunday), after attending to the 57 varieties of jobs that friend wife always saves up for me to do on Sunday, I went to the shop and put in several hours checking over drawings to detect any possible errors before work was started on the engine.

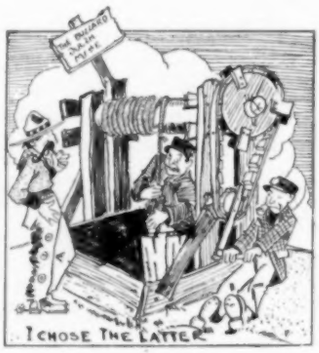
After a good night's sleep I showed up at the shop this eventful Monday morning, at peace with all the world and feeling fit for anything that might transpire. It soon became apparent that I had need of all my faculties and to be an extreme optimist besides.

Two men who were most needed, being on repair work promised at a definite time, had not recovered from their pay-day drunk and could not be expected to work while they had any money left. Also the new man did not seem to be quite so familiar with his work as his talk led me to believe. However as the forging for the crankshaft was already centered and in the lathe I started him on it, first making sure that he understood the drawing and thinking that he could

do little harm on the roughing cuts anyway, especially as I would be there to watch him.

Putting the best apprentice boy on one of the promised jobs I went to work on the other, and all seemed well, as we could still get these jobs out on time as agreed.

Just then I was called to the office 'phone, there being a very much excited man at the other end of the line who said that a second-hand pump we had sold him was not working; the mine " was filling with water; come quick."



This mine was about four miles away, the road hardly more than a trail, it was raining hard and blowing a gale, our trouble shooter was out on a job and the proprietor sick, so there was nothing left but for me to go. I was soon on the road behind a pair of sturdy mountain horses —there are some roads here that even a Ford fears to navigate—the rain had turned to snow and I arrived at the mine chilled through.

This mine was in the development stage and had no proper cage running in ways; only an old Cornish kibble, or iron barrel, swinging loose in the shaft. I could either go down a wet, slippery ladder or ride in the kibble. I chose the latter, and after bumping against the sides of the shaft several times, arrived at the pump station, about 90 ft. from the surface. The pump was an ordinary duplex of a well-known make, and as usual had holes drilled and tapped on both sides for both steam and exhaust pipes, so that it could be piped from the side that was most convenient, and it had left the shop with a plug in one inlet and one exhaust hole as is the usual custom.

One Way to Pipe a Pump

One glance showed the trouble. They had taken the plug out of the inlet and with it and a bushing had plugged the other exhaust hole, the steam now going in at one side of the steam chest and out of the other. (This is absolute fact.) The miners said the piping was done to the superintendent's orders. As no exhaust pipe nad been connected the steam in the shaft made it very much like a Turkish bath.

I put the plug back where it belonged and had the pump running in five minutes, and returning to the surface I reported to the superintendent. He was very indignant, saying it was all my fault; that no decent shop would have sent a pump out without a drawing of the piping; that he would give us no more work, and that he surely would not pay for my trip to the mine. I saw at once that this was a case that required diplomacy, so taking a seat on an empty powder keg and lighting my pipe I proceeded to apply the only kind of diplomacy that I have ever known to be of use when dealing with this type of man.

I told him first that we had insisted on getting cash for the pump as it was well known that his mine was no good—in fact it was a wild-cat mine; second, that we did not want to work for such a man as he proved to be, and third, I had noticed that the mine shaft was not timbered to comply with the law, and that I thought it my duty to report it to the state mine inspectors.

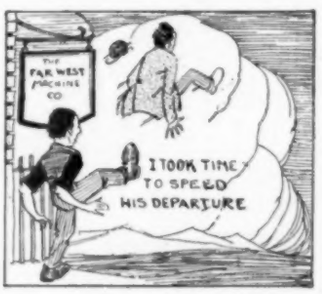
The bluff worked, for as I started to leave in a great make-believe rage he called me back, asked what the bill was, and handing me a check for the amount requested me to say nothing about the shaft as he would immediately have it timbered properly.

More Trouble

Quite proud of the diplomatic manner in which the bill had been collected I returned to the shop in a very contented frame of mind, thinking the worst was over, as it was such a stormy day the other mines might not send for their promised jobs. There was however another jolt waiting for me, as on entering the shop I saw that the new man had the crankshaft blocked up and the tailstock pulled back. He had not slacked the center as the shaft expanded in length from the heat generated by the cut, and as a result the center was badly cut. This was apparent at a glance, and seeing the man at the grindstone I questioned him and found that he had ground the center nearly smooth on the emery wheel and was now putting a nice finish on it with the grindstone.

Now of course in the good New England city where I learned my trade it was generally understood that no really good work ever had been or ever could be done west of the Hudson River. Still from reading the *American Machinist* I had been led to believe that it was not considered good practice in the best shops even in the Middle West—where this man claimed to have worked—to finish lathe centers on the grindstone. Also the man was drunk. I was afterward told that as soon as I left for the mine he had sneaked out the back way and got a big bottle of booze.

I wonder if all foremen hate drunken men and the liquor business generally as much as I do! Ordinarily it is hard for me to discharge a man and I never do it without good cause, as I realize that it usually means suffering and privation for those dependent on him for support, but I can truthfully say that I gave this man the three-quarter day's time that was coming to him with pleasure.



The pleasure, however, was not mutual, as he took his discharge with very bad grace and wanted to fight, I explained that I could not possibly spare the time to fight, but I did take time to speed up his departure a little by applying the toe of my boot with considerable emphasis where it would do the most good, to the great delight of our apprentice boys, who deeply regretted that there was no one there to film the scene.

A Few Minor Details

Then after looking the shop over, straightening out several small troubles, starting some men on another urgent repair job that had come in during my absence, having the usual scrap with the foundry foreman about the blast for the cupola not being strong enough, and

wasting a half hour in the office convincing a customer that his bill was not exorbitant, I resumed operations on the promised job, which by working like a good fellow and going without my supper I was enabled to finish at 11 p.m., just as the truck from the mine drove up for it.

The storm was now over and the moon shining brightly. After helping load the job on the truck and wishing the driver a pleasant trip I went home and to bed, and while listening to the somewhat incoherent remarks of a very sleepy woman about a man that didn't know enough to work at his trade as journeyman and let someone else do the worrying I dropped into a peaceful sleep to awaken in the morning with a good appetite and ready for any old thing the fates should see fit to send me.

New Opportunities for Machine-Tool Builders

By L. W. ALWYN-SCHMIDT

Any outlet for our supply of machine tools is of course a welcome prospect and the chances of disposing of some of our products to foreign users look bright. At the same time there will be calls for machines designed to fill requirements different from the old ones, and the man who is ready to jump in with new machines when the avenues of trade are opened will reap a harvest.

THE principal feature of machine-tool construction during the war was the rapid increase in the demand for machines capable of doing heavy work but the coming of peace has put a stop to this demand and the machine-tool makers must turn their production into more normal channels. A good deal has happened, however, during the last three years, and peace is not going to cut short the development put into motion by the war. To replace the dead and to assist the crippled to return to earning occupations will require more than ordinary effort, and it can not be done without changing materially the aspects of our industrial production.

Not the Only Industrial Problem

But this is not the only industrial problem caused by the war. By accelerating the speed of the economic machinery of the world the parts have been tested more thoroughly than would have been the case in times of peace, and some of them have broken down seriously. Defects have come to our notice which we had not expected and which now will have to be repaired. But at the same time new sources of power have been discovered which will continue to be at our call and will equalize to some extent the losses which have occurred in other directions.

The effect of all this on the machinery industry can hardly be overestimated. Supplying the tools for all industrial operations, it naturally must feel keenly all that moves the industries which are its customers. As a result it faces a series of problems, technical and economic, upon the successful solution of which must depend to a great extent the smooth readjustment of the world's industrial activities.

The outstanding feature of this new development seems to be the exceptional demand for raw materials. During the war this demand was met by replacing many standard materials with substitutes, and by opening new sources of the materials already in use. In Germany it became necessary, for instance, to replace the iron bearings which in turn necessitated changes in brass-lined bearings in most machines by all steel or the general construction of individual machine parts. There is, however, a still more interesting form of substitution where entirely new products have taken the place of the old ones. So wooden soles have been substituted for leather ones in many European countries. To make these wooden soles special machines have been designed which are turning out great quantities of the article. Machines also had to be built to weave and spin the many textile substitutes which have been tried. Many of the processes used during the war will no doubt be retained in the future, as will many of the new materials. Peace will give a better opportunity to develop the industrial possibilities of these articles, and with their development there will arise a demand for machinery suitable for their production. This demand will have to be studied by the machine industry with a view to meet it when it arises in our own and in our foreign markets.

New Sources of Raw Materials

As an example of the opening of new sources of raw materials in addition to those already known the case of manganese may serve. Before the war manganese came principally from Asiatic sources. The rapidly increasing demand made necessary the exploitation of additional supplies and led to the development of the manganese mines of Brazil which until then had been of secondary importance only.

In our own country great progress was made in the treatment and production of low grade ores of all kinds. Under normal conditions we would hardly have attempted to work many of the low grade deposits because there was no economic necessity, and the cost of working them was too high for ordinary purposes. Only with the failure of the high-grade ores which was not expected to occur in the near future would we have been compelled to use the lower ores. Now we have been forced to do it many years earlier, and having once begun we can not turn back. We must continue working the mines after operation has once been started, and it is up to our machinery designers to construct machines which will work so cheaply and efficiently as to make possible the exploitation of low-grade ore mines even under the conditions of a normal peace market with lower prices.

International competition will force us to do this in our country, and it will force other countries to do likewise. Our machinery designers, therefore, have here a program for their enterprise already cut out. We must have machines which will cheapen production, not only to be used in mining operations, but in all industrial lines.

The saving of labor is bound to play a considerable part in after-war economics for it is obvious that our

industries will have to get along with a smaller supply of labor than in pre-war times. Europe has lost a great part of its man-power and is not likely to give us much assistance in this respect, even if no special labor immigration law is enacted. We are confronted by the necessity of having to sustain a vastly increased demand for industrial materials with a decreased number of men. Only well directed application of machinery can help us over this serious difficulty.

Before the war Europe was just ready to make the change from individual production to machine production on a large scale, but foreign industrial experts are of the opinion that the war has arrested this movement and directed it into a different channel. In fact, there will be more artisan establishments in Europe after the war than before in proportion to the available producers and they will be better equipped. The explanation given for this is rather simple. The great number of men who have lost in productive efficiency owing to the loss of an arm or leg will be forced to use machinery to make up their loss and to increase their earning capacity, and consequently small shops fully equipped with labor-saving machinery will be found everywhere. With the increase of machine equipment, naturally, there must also be an increase in the number of repairs, and small machine shops will be required to do this work.

No Interest Shown in Building Small Labor-Saving Machinery

The American machine-tool industry so far has shown little interest in the building of small labor-saving machinery. We have been very successful in the designing and constructing of labor-saving tools for all kinds of artisan production, as carpenter tools, lockmaker tools, etc. But we have so far been somewhat behind in designing actual machine tools for the small repair shops. The European machine construction shops have not been much more alive to the situation. They have the advantage of having always built a great number of cheap machine tools which were in the reach of the pocketbook of the small artisan and which in consequence found their way into this kind of establishment. The artisan of today, however, does not want a second-rate machine tool but desires on the contrary a first-class tool at reasonable cost. In former years we have had the excuse that we were not equipped for the construction of machine tools of which a small number only was required. The conditions seem to be changed now as a large demand exists for these tools. For one small repair shop existing four years ago, two or three may be found in a few years in Europe, and each of these shops will be a purchaser of this class of tools, provided somebody will always produce them at a cost which makes their employment possible in a small shop.

The sale of these machines will not be confined to Europe only. We have already a demand for these tools in our own market large enough to make it worth while for any manufacturer to develop it. The South American market has vastly increased owing to the growth of a general industrial activity in countries which in pre-war times were only indifferent customers for American machine tools. Our machine construction shops have many orders from this quarter for minor industrial machinery of all kinds, shoe machinery, textile machinery, button-making machines, and many others having recently been shipped in fair quantities. The installation of these machines and their future maintenance will bring in turn a demand for a larger number of repair and engineering shops similar to that in Europe and the United States. Formerly these shops bought the cheaper English, German, or Dutch machine tools and they also offered a very receptive market for European second-hand machine tools. If we can give them a new American machine tool having all the advantages of a high-class tool combined with that of a lower price, we certainly should find them very appreciative of our offer. Greece, Turkey and the Balkan countries are all just entering a state of industrial development where the existence of a well-equipped machine-repair industry becomes estential. We should therefore be prepared to attend to their wants. A very distinct demand for small machine tools suitable for repair work is also to be expected from the shipbuilding industry. Tools will be required for installation in the repair shops aboard the new ships which are now building all over the world. The submarine warfare has sent hundreds of these small repair outfits to the bottom and they will have to be replaced in the near future.

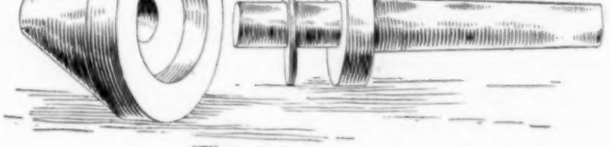
It would not be the first time that our machine constructors have come to the aid of the world to assist in the solution of its problems for it is not so long ago that the reaper and other labor-saving agricultural implements were invented which make possible today the production of the enormous quantities of foodstuffs required to sustain the rapidly-growing population.

A different need has now arisen and there is every reason to believe that it will be met by the machinery manufacturers as they have met other needs. Naturally we hope that the American builders will capture their share of the business for they have a reputation to live up to, but they must be awake to conditions as there are new forces at work along these lines in England and France which are not to be ignored. A time of readjustment like the present offers rich returns to the well-equipped manufacturer who is willing to enter new fields.

The Right Way to Make a Pipe Center

By M. L. Lowrey

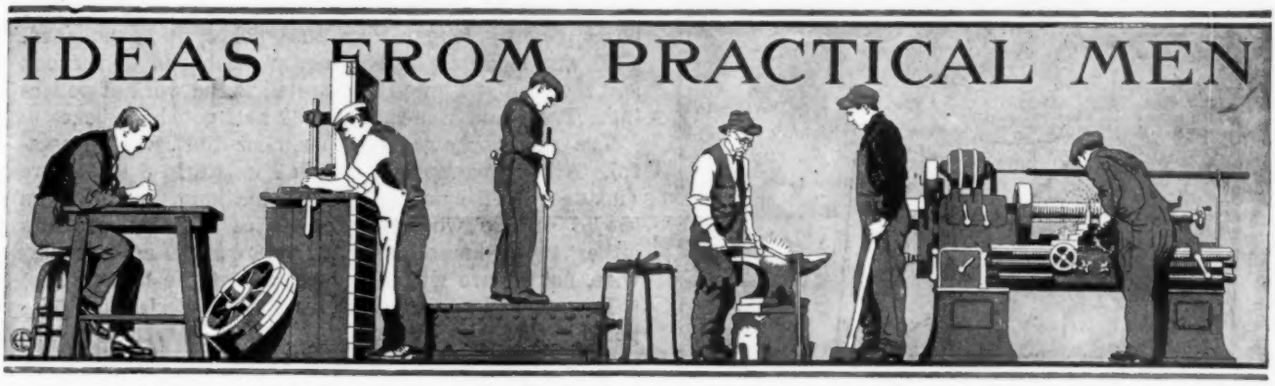
The pipe center shown in the cut is what I have been using for many years, but it does not seem to be as generally known as it should be, at least on this coast, judging by the many miserable makeshifts that I see in the shops that I visit.



A PIPE CENTER

The revolving member should be made of rather hard close-grained cast iron and should be turned to an angle of 60 deg. (in many shops I find them turned to 90 deg.) The arbor is usually made of low-carbon steel, and is somewhat better if casehardened and then ground true.

The two features making this a good pipe center are the big collar or flange on the arbor, which helps to steady the center, and the thrust washer of rawhide, if it can be obtained; if not a fiber washer will do.



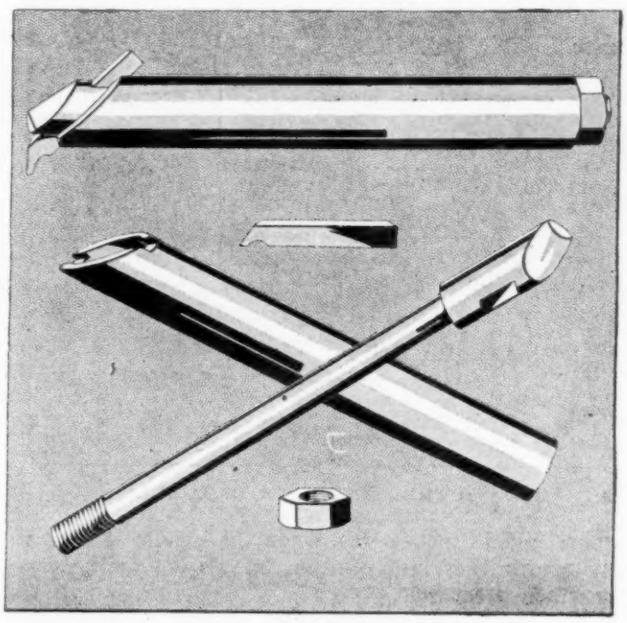
Handy Form of Boring Bar

By M. L. Lowrey

The sketch shows a bar for holding boring, or inside chasing, tools that I think hold the tools more securely than the one illustrated on page 153 of the *American Machinist*.

It may be made of a size to fit whatever fixtures the shop is supplied with and of any required length. If the end of the bar is milled to exactly 45 deg. it is easy to grind the tools to any angle desired by using a protractor.

This bar is especially useful in boring or threading



THE BORING BAR

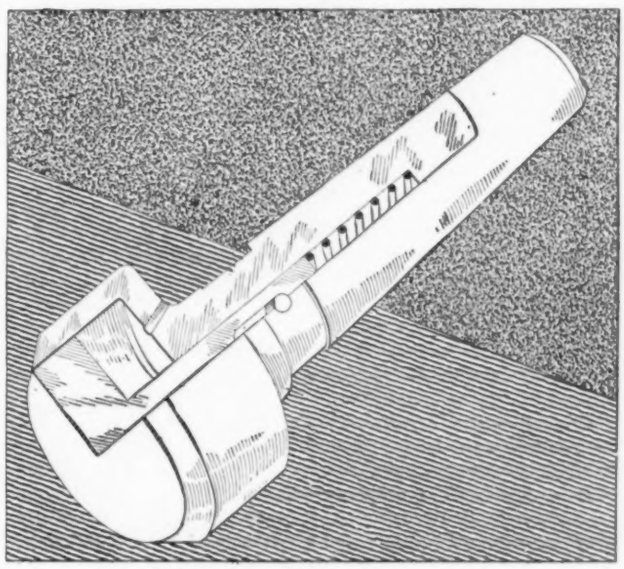
to the bottom of holes, and has the advantage of being easily made, of holding the tool firmly, can be rotated to give any top rake desired, and there is no projecting setscrew to be in the way or to be bent or broken off.

Punch for Cutting Microphotographs

By Charles A. T. Kerr

The tool shown in the sketch is one that I designed for cutting out the round microphotographic prints used in connection with analysis work.

The construction is plainly shown in the cut. The recess in the punch should be ground and lapped smooth after hardening and the spring plunger nicely fitted. The slot in the shank of the plunger, which in connection with the pin keeps the plunger from coming out, is made of the right length to allow the latter to project a few thousandths beyond the edge of the punch. This serves to protect the sharp cutting edge from injury



PUNCH FOR CUTTING PHOTOGRAPHS

and at the same time furnishes a means of holding the photograph flat when cutting it.

The two small holes at the bottom of the recess are air ducts to prevent the trapping of air, which would cause the plunger to work sluggishly.

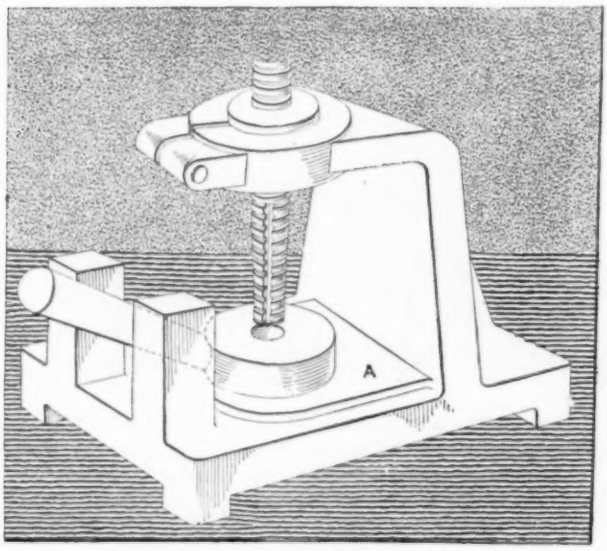
The photograph to be cut should be laid on a hardwood block and the punch struck lightly with a mallet.

Starting a Thread Always in the Same Place

By S. B. Royal

The clamping handle shown in the sketch was required in large quantities and it was necessary to have the handles always stop in the same position when tightening.

The surface *A* of the jig was finished, as was also the under surface of the pieces to be tapped. A bracket that was part of the jig carried a threaded bushing to which was fitted a special tap having a thread 2 or 3 in. longer than was necessary to tap the work. The flutes of this tap were not carried up any farther than was necessary, however, so that the part working in the bushing was a full thread.



JIG FOR TAPPING CLAMPING NUTS

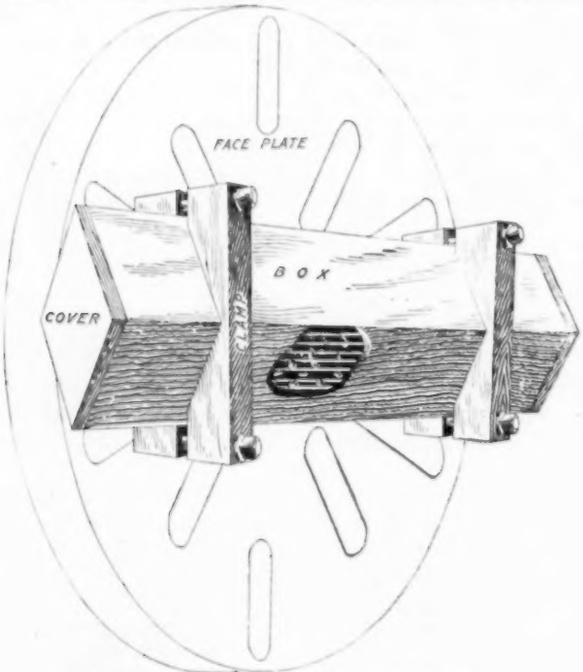
The pieces to be tapped rested on the finished surface of the jig with the handle extending between the two uprights in front, thus the threads would be started in the same place with reference to the handle in each piece. The bushing was a push fit in the bracket and was held from turning by a clamping screw. This allowed an adjustment of the starting point of the thread, which was determined by trial. Correctly set and clamped, all pieces tapped in the jig would be alike.

Improvised Tumbling Barrel

By M. E. Duggan

The tumbling barrel shown on page 158 of the *American Machinist* reminds me of an experiment in one of the large bicycle factories where I was employed to make a machine, or tumbling mill, that would take the place of hand polishing on bicycle spokes.

The commercial sized mill was tried out and proved a failure; then a wooden-box tumbler was made, 8 in. square and 12 ft. long, the inside partitioned off into boxes slightly longer than the spokes to be polished. This was mounted on bearings at each end of the box and revolved at a speed best suited to the work of polishing. The result was tangled and half-polished spokes.



AN EXPERIMENTAL TUMBLING BARREL

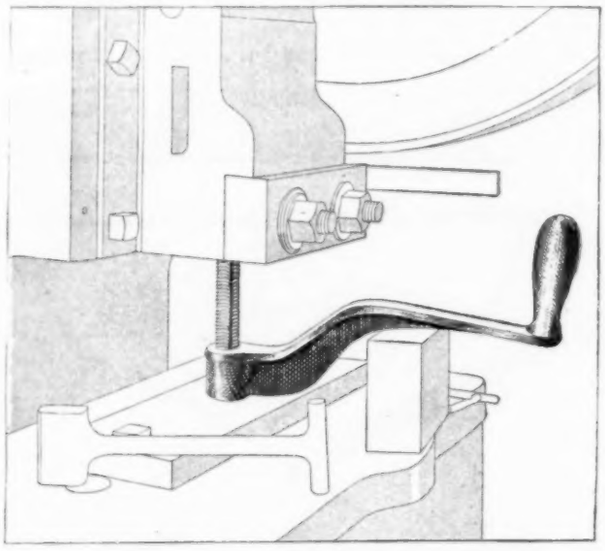
The sketch shows an experiment that was successful. A box was made of maple 1 in. thick, 6 in. square (inside measurement) and 30 in. long, mounted as shown on the wooden faceplate of a patternmaker's lathe. It will be noticed that the box is fastened cornerwise, not square with the faceplate of the lathe.

Leather and pumice stone were the materials used for polishing. Strips of leather $\frac{3}{4} \times \frac{1}{4}$ in. were used. The tumbler was revolved at a speed that would allow the spokes and polishing leather to slide all the way from one end to the other of the tumbling barrel.

Broaching in a Punch Press

By J. Wright

The handles used on the controllers of electric street cars are made with variously shaped holes in the boss which fits over the shaft of the movable contact, these holes being of irregular shape for the double purpose of preventing the operation of the car by unauthorized persons and to insure that when the handle is used it shall occupy the right position in relation to the contact which it controls.



PUNCH PRESS USED FOR BROACHING

The Chicago surface lines use a similar handle for operating the door-opening mechanism of their cars, and on this road the holes in question are four sided with two right-angled corners, the fourth side being curved instead of flat. The handles are made of malleable iron with a cored hole, leaving but a small amount for finish, and the finishing operation is accomplished by broaching in the manner indicated in the illustration.

A short broach is used for this purpose and is driven through the hole by means of an ordinary punch press. The broach, which is small enough on one end to enter the cored hole, is placed in position and the handle then held under the gate of the press so that the first stroke drives the broach a distance of possibly half an inch. The operator holds the small device in his other hand, and on the next stroke of the press

he lays this tool flatwise on top of the broach. The press then drives the broach through an additional inch, and a quarter turn of the piece stands it up into the position as shown, enabling the press on its third stroke to force the broach down until it is nearly flush with the top of the handle, in which position it has finished its cut and is easily removed.

It will be noticed that the plate has been laid on the bed of the press, and this has a hole through which the lower end of the broach passes.

Inside Diameter of Threads

BY HOLGER CARSTENSEN

The table shown gives the root diameters of United States Standard threads when the nominal bolt diameter and number of threads per inch are known. It can be mounted on a 3 x 5-in. card for reference.

FIGURES IN FIRST VERTICAL COLUMN REPRESENT OUTSIDE DIAMETER. FIGURES IN FIRST HORIZONTAL COLUMN REPRESENT NUMBER OF THREADS PER INCH

	20	18	16	14	13	12	11	10	9	8	7	6	5½	5	4½	4
1	0.935	0.928	0.919	0.907	0.900	0.892	0.882	0.870	0.856	0.837	0.814	0.783	0.764	0.740	0.711	0.675
1⅛	1.060	1.053	1.044	1.032	1.025	1.017	1.007	0.995	0.981	0.962	0.939	0.908	0.889	0.865	0.836	0.800
1¼	1.185	1.178	1.169	1.157	1.150	1.142	1.132	1.120	1.106	1.087	1.064	1.033	1.014	0.990	0.961	0.925
1⅜	1.310	1.303	1.294	1.282	1.275	1.267	1.257	1.245	1.231	1.212	1.189	1.158	1.139	1.115	1.086	1.050
1½	1.435	1.428	1.419	1.407	1.400	1.392	1.382	1.370	1.356	1.337	1.314	1.283	1.264	1.240	1.211	1.175
1⅝	1.560	1.553	1.544	1.532	1.525	1.517	1.507	1.495	1.481	1.462	1.439	1.408	1.389	1.365	1.336	1.300
1¾	1.685	1.678	1.669	1.657	1.650	1.642	1.632	1.620	1.606	1.587	1.564	1.533	1.514	1.490	1.461	1.425
1⅞	1.810	1.803	1.794	1.782	1.775	1.767	1.757	1.745	1.731	1.712	1.689	1.658	1.639	1.615	1.586	1.550
2	1.935	1.928	1.919	1.907	1.900	1.892	1.882	1.870	1.856	1.837	1.814	1.783	1.764	1.740	1.711	1.675
2⅛	2.185	2.178	2.169	2.157	2.150	2.142	2.132	2.120	2.106	2.087	2.064	2.033	2.014	1.990	1.961	1.925
2¼	2.435	2.428	2.419	2.407	2.400	2.392	2.382	2.370	2.356	2.337	2.314	2.283	2.264	2.240	2.211	2.175
2⅜	2.685	2.678	2.669	2.657	2.650	2.642	2.632	2.620	2.606	2.587	2.564	2.533	2.514	2.490	2.461	2.425
3	2.935	2.928	2.919	2.907	2.900	2.892	2.882	2.870	2.856	2.837	2.814	2.783	2.764	2.740	2.711	2.675
3⅛	3.185	3.178	3.169	3.157	3.150	3.142	3.132	3.120	3.106	3.087	3.064	3.033	3.014	2.990	2.961	2.925
3¼	3.435	3.428	3.419	3.407	3.400	3.392	3.382	3.370	3.356	3.337	3.314	3.283	3.264	3.240	3.211	3.175
3⅜	3.685	3.678	3.669	3.657	3.650	3.642	3.632	3.620	3.606	3.587	3.564	3.533	3.514	3.490	3.461	3.425
4	3.935	3.928	3.919	3.907	3.900	3.892	3.882	3.870	3.856	3.837	3.814	3.783	3.764	3.740	3.711	3.675

TABLE OF ROOT DIAMETERS

The values in the body of the table were obtained by subtracting twice the depth of thread from the nominal outside diameter. In the U. S. S. thread the depth is obtained by dividing 0.6495 by the number of threads per inch.

Holding Fixture for Grinding Flat Gages

BY HUGO F. PUSEP

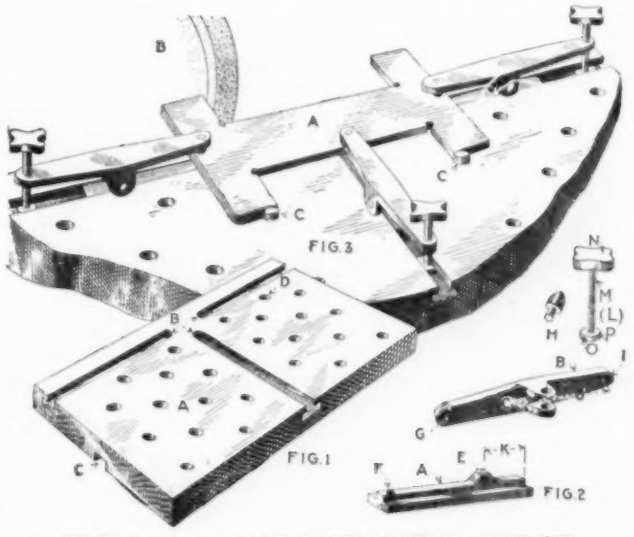
Several months ago a tool shop having a large number of flat gages to manufacture experienced trouble in making the promised deliveries. On investigation it was found that a large majority of the gages after having been ground had to be "closed in" and reground. As the gages were made of machine steel carbonized, it meant annealing and rehardening after the closing-in operation, which necessitated a lot of extra work. It frequently happened, especially with longer gages, that they were ground two or three times before a satisfactory job could be produced, the nature of the trouble invariably being that one edge of the ground-gage opening was found to be over size while the other was much under the size measured when the gage had been ground and was still held by clamps to the gage-grinding-machine table. Gages with comparatively small gage openings seldom if ever gave any trouble; therefore the method of clamping or rather the difficulty of clamping a long, thin gage properly had to be overcome.

All flat gages made of machine steel will distort to some extent after carbonizing and hardening, no matter how carefully these operations are done. This distortion, however, is not sufficient in the majority of cases to warrant the expense of surface grinding the sides; but the ordinary clamping methods of a gage-grinding machine will always find the uneven surface of the gages, thus resulting in more or less faulty work. To overcome this and to enable a semiskilled grinding-machine operator to hold slightly distorted gages for grinding with absolute certainty of no change taking place after releasing the clamps, a holding fixture was designed.

It consists of a cast-iron base plate *A*, Fig. 1, having three T-slots *B* milled on its upper face, as shown. The under side of the base has two milled slots *C* extending about 2 in. from each end for accommodating locating keys. These slots are parallel to the front of the fixture. The series of ⅜-in. holes *D* are so located that any two holes in corresponding rows on either side of the central T-slot are equidistant from the front edge of the fixture base.

Fig. 2 shows the construction of the clamps, of which there are three, all identical, one for each T-slot in the baseplate. The lower half *A* is a free sliding fit in the T-slot; the upper half *B* has two lugs *C* which straddle the single lug *E* on the lower half of the clamp, being pivoted on a pin driven through holes in the lugs. After the pivot pin is in place the two halves of the clamp are set up parallel and the holes *F* and *G* are drilled and reamed in line with each other. Into these holes are driven special bullet-pointed plugs made of vulcanized fiber of the form *H*, Fig. 2. The clamp-screw hole *I* is drilled and tapped with a tap to suit the size of clamp. Distance *J* is to be longer than *K* in order that the clamp screw will come clear of the lower half of clamp.

The clamp-screw assembly is shown at *L*, Fig. 2, and consists of the screw *M*, cross-knob *N* and the thrust collar *O*. This thrust collar is made a loose fit on the



FIGS. 1 TO 3. FLAT GAGE-HOLDING FIXTURE

Fig. 1—Baseplate of fixture. Fig. 2—Clamp and clamp screw. Fig. 3—Fixture in use.

reduced end of the screw, being held in place by a small pin *P*, which engages a groove cut near the end of the reduced portion of the screw. The two halves of the clamp, the clamping screws and the thrust collars are cyanided before assembly.

The sketch in Fig. 3 shows how this clamping fixture works. Gage *A* is located square with the grinding wheel *B* with the gage opening overhanging the front edge of the fixture by two shoulder pins *C* in suitable holes. Then the three clamps are slid forward into position, as shown, and the clamping screws tightened. As the thrust collars at the ends of the clamp screws bear directly on the bottom of the T-slots the action of tightening the clamp screws serves two purposes, that of clamping the gage between the ball points of the fiber plugs in each half of the clamp and at the same time locking the latter in the T-slots of the base-plate. A three-point bearing is thus provided, eliminating all possibility of distortion of the gage, no matter how uneven the surfaces clamped.

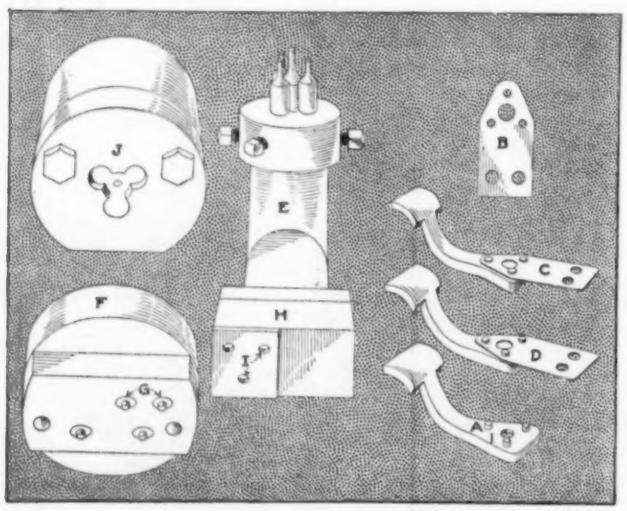
This fixture was originally made for the regular gage-grinding machine, but so successful was the performance of it that another one was constructed to fit the shop tool-grinding-machine table. All trouble from rejected gages through faulty clamping disappeared after the installation of these fixtures.

Method of Forming Substitutes for Copper Rivets

BY J. V. HUNTER

The contact fingers used on street-car controllers are copper drop-forgings to which phosphor-bronze springs are riveted to hold them in contact with the rotary member which is operated by the controller handle.

One of the fingers is shown at *A* in the illustration and a spring at *B*. When assembled they appear as at *C*. It has been the practice when making these parts



DIES FOR FORMING RIVETS AND RIVETING SPRINGS ON CONTROLLER FINGERS

in the shops of the Chicago surface lines to drill holes in the fingers and rivet the phosphor-bronze springs in place with copper rivets.

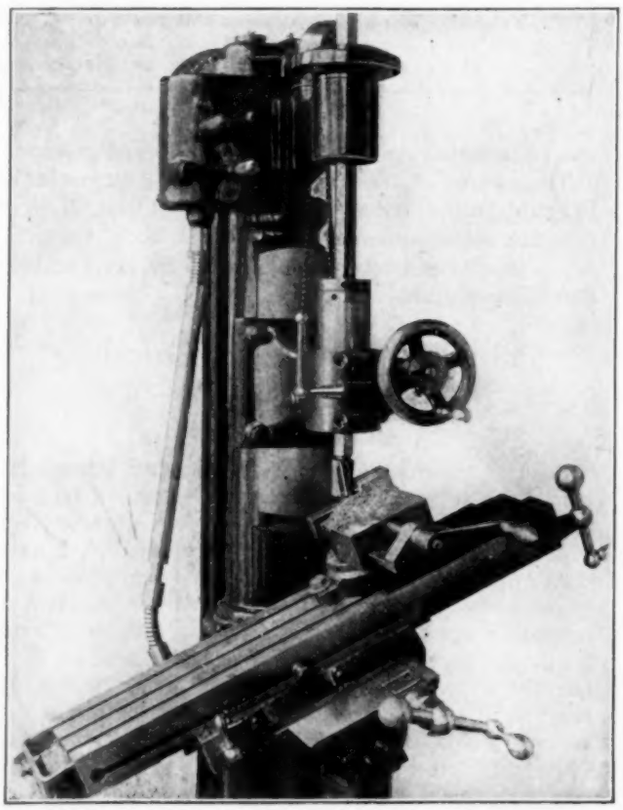
An improvement on this method has been devised in which the holes in the finger are dispensed with and three projections raised from the metal itself by what is practically an embossing or drawing operation. These projections may be seen on the piece *A*, while at *D* is a finger on which the phosphor-bronze spring has been placed but has not been riveted. The completed operation is shown at *C*.

At *E* may be seen the punch that is used for piercing the copper forging. The central punch is longer than the others in order that it may pierce the center hole while the others are drawing the slug projections that form the rivets. The die *F* is used for riveting the work, the small projections *G* fitting into the recesses on the under side of the finger to prevent the metal from being pushed back when struck by the heading punch *H* which is used in connection with this die. The end *I* of this punch straightens and flattens the forging before the spring is put into place to give it a true bearing surface, while the other end is used for riveting. *J* is the piercing and drawing die used in connection with the punch *E* for raising the projections which serve as rivets.

Flexible Couplings Instead of Universal Joints

BY GEORGE ALLEN

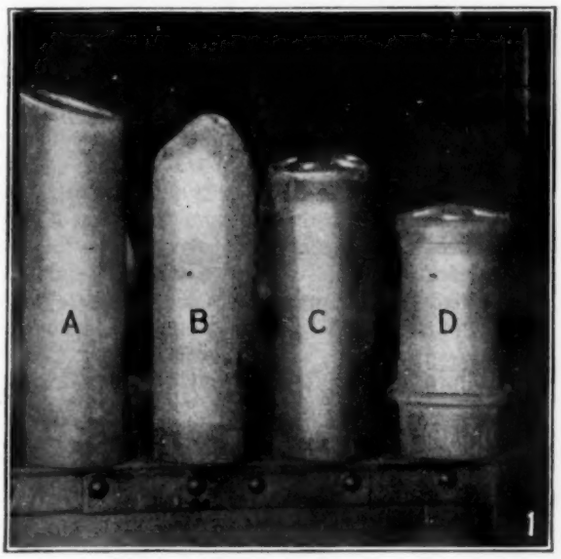
The ordinary universal joint is apt to be more or less jerky in its action. In order to obtain a smooth feeding action on our Knight milling and drilling machine we put on Karge flexible shaft couplings in place



MACHINE FITTED WITH FLEXIBLE INSTEAD OF UNIVERSAL JOINT COUPLINGS

of the regular universal joints, as shown in the illustration. This gives not only a smooth even feed but it "cushions" enough to preserve the cutter in case of a catch anywhere.

AUTOMOTIVE CONSTRUCTION



FIGS. 1 AND 2. STAGES OF LIBERTY-MOTOR CYLINDER FORGING AND FIRST FORGING OPERATION

Operations on the Liberty Motor Cylinders

By FRED H. COLVIN

I. Method of Forging

It is hard to realize just how much the development of the method of forging Liberty motor cylinders shown herewith had to do with making possible the production which was obtained. There can, however, be no doubt as to the great saving in both material and labor over the usual method of making steel cylinders from the solid billet. The operation methods shown should be applicable in other work of a similar nature.

THE use of steel cylinders in airplane motors involves either boring the cylinder from a solid billet, as is done in the Gnome and similar motors, or reducing the weight of the blank, as well as the amount of boring necessary, by some sort of a piercing operation.

When the Liberty motor became an assured fact the cylinders for these motors presented a very serious problem, and the engineering organization of the Ford Motor Co. got busy to devise a way by which cylinders could be made with comparatively thin walls so as to reduce the amount of boring and also to reduce the amount of metal used and to increase the output of the forging plant.

After much experimenting the engineers in charge devised the method illustrated herewith which was so successful that, after they demonstrated the reliability of these forgings, as well as their other advantages, the Ford company received contracts for making the cylinder forgings of all Liberty motors, regardless of who machined them. The tubing used had a wall about $\frac{1}{2}$ in. thick, and the first operation was to bevel the upper end as shown at *A*, Fig. 1. The beveled end was then heated, placed in a die as shown in Fig. 2,

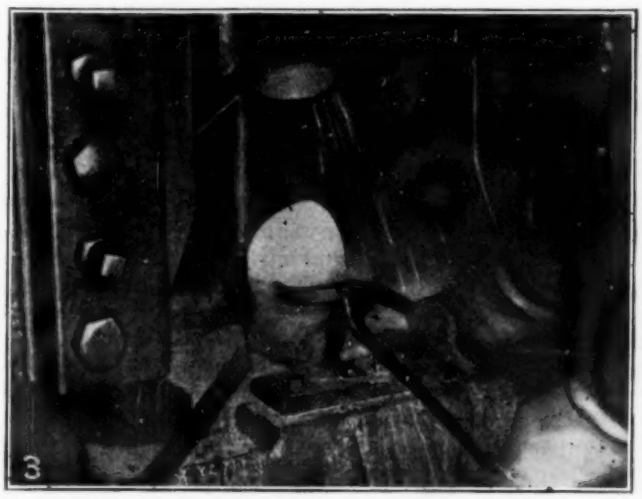


FIG. 3. REMOVING FORGING FROM THE DIE

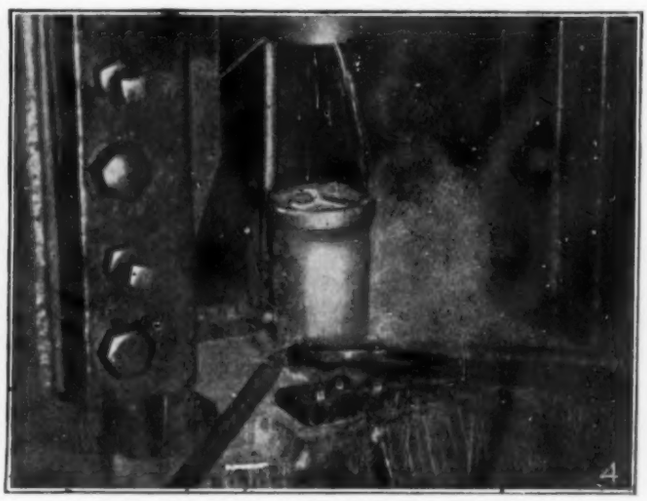


FIG. 4. AFTER THE SECOND FORGING

AUTOMOTIVE CONSTRUCTION

and the punch brought down, which formed the end as in *B*, Fig. 1, also shown in Fig. 3, where a forging is being removed from the die after the first operation.

The next operation closes the end of the cylinder to its proper position as shown at *C*, and as also indicated in Fig. 4, where another forging is being removed from the press. Referring again to *B*, Fig. 1, it will be noticed that the upper end of the tube has not been completely closed, and that a small opening remains. No attempt is made to weld this opening. It will be observed that this hole comes on one side of the cylinder head, this being accomplished by the bevel on the end of the tube before the first operation. The bevel throws the opening over to the other side as shown, and when the head is finally closed down to its proper position the location of the opening is such that it is bored out for one of the valve openings. For this reason no attempt is made to weld it, as it does not matter whether it is welded or not.

The final operation is the upsetting of the cylinder flange in the bulldozer shown in Fig. 5, a somewhat better view of this being seen in Fig. 6, where the forging is being held in a pair of tongs while being removed from the bulldozer to the pile of forgings. This is also shown at *D*, Fig. 1. Before flanging, the lower end of the cylinder is dipped in water to stiffen it against flow at this point. This method of forging cylinders is interesting and had much to do with making possible the rapid production of the Liberty motor.

FIG. 5. UPSETTING THE FLANGES

FIG. 6. THE FINISHED FORGING

British Tractor Trials

In view of the altered European position it has been decided to hold extensive tractor trials in Great Britain during next September. This decision has been reached by the Agricultural Machinery Committee of the Society of Motor Manufacturers and Traders, and has been communicated to firms likely to be interested, with the request for their opinion.

European Motor Truck Sales Field

C. A. Vales, truck sales manager of the Locomobile Co. of America speaking at the N. A. C. C. Truck Convention was pointing toward the difficulties which have to be encountered by the industry in selling trucks to Europe. Concerning post-war conditions, he said: "They are making more plans today to go after the truck business of the world than we are in the United States. Their factories now have the equipment, trained men and quantity producton methods to turn out the trucks. Sales of American trucks in Europe will not only be difficult but European manufacturers will compete with us in foreign markets. The tool equipment of European factories is now five times what it was in 1914. England can produce enough trucks and tractors for all Great Britain and her colonies. France, before the war, made trucks by hand, aided by machine tools, but no real standardization. Now all is changed; progressive assembling and interchangeability is the rule. The French have taken advantage of every improvement found in the American cars and trucks during the war."

Pan-American Aeronautic Convention

The second Pan-American Aeronautic Convention and Exposition will be held during the month of May at Atlantic City, in a form of a big outdoor aviation event, under the auspices of the Aëro Club of America, the Aerial League and the Pan-American Aeronautic Federation. The governing idea of the Exposition is to prove that both the airplane and dirigible can be used for business as well as for pleasure. The program includes three flying contests with prizes of $1000 each, awarded by the will of the late Samuel H. Valentine and by Glenn H. Curtiss. The representatives of railroads, express, steamship and other transportation organizations of America and of all the allied and Latin-American countries have been invited to participate and attend the various discussions.

The Cleveland Universal and Plain Milling Machines

THE Cleveland No. 1 universal and plain milling machines are, of the constant-speed driven type, with 16 changes of feed and of spindle speed. Speeds and feeds are controlled by two levers of the ball-joint type, similar to an automobile gear shift. Changes for both speeds and feeds are obtained through sliding gears which are automatically lubricated. The square overarm and many other improvements are features. Fig. 1 shows the universal type and Fig. 2 the plain type. The detailed specifications will be seen under the illustrations. The column is a complete box section of rigid construction. The base and column are cast in one piece to form a heavy ribbed semi-steel casting, tied together with vertical and horizontal walls. The only openings in the column are those necessary for the change gear levers on the front, the pulley drive housing in the rear, and the cutter lubricant tank on the left side of the machine. Opening of the column is absolutely unnecessary. All the interior parts are lubricated automatically, and all adjustments on the bearings are made from the outside. The dovetail knee slide extends upward to the overarm, thus affording ample surface for clamping the attachments. The depth of the column has been carefully determined in order to place the spindle and the shaft bearings in proper relation to each other to secure maximum rigidity. The dovetail slide on the face of the column is so constructed that the heaviest pressure is not taken at the thinnest section of the column wall as is often the case in milling-machine construction. The horizontal wall separating the lubricating oil reservoir from that of the cutter cooling compound is designed to give added rigidity to the column. The lower surface of the base is finished to give it a firm foundation, while the contour of the upper surface is pan-shaped with depth enough to catch oil and chips, thus keeping the surroundings clean.

The knee of the machine is strong enough to bear any weight which may be placed on it while doing the heaviest work and has an improved dovetail slide. The bearing of the saddle is not on the thinnest section of the dovetail slide, but on the flat, wide surface, the narrow slide acting as a guide only. There is no bearing in the top of the dovetail guide which eliminates the possibility of marring due to the operator laying tools on the top of the knee. The bearing of the knee on the column is carried well above the top of the saddle slide, thus giving the knee a longer bearing on the column and reducing the bearing pressure to a minimum. The feed box, as well as the knee, is entirely closed to eliminate the possibility of chips getting into the feed mechanism in the knee. The elevating screw is large in diameter and in one piece. By the use of the post the telescopic screw has been eliminated, the post acting as a support to the elevating nut and as a guide in the knee. The screw is operated with a double bevel gear, hand-feed and power-feed being independent of each other.

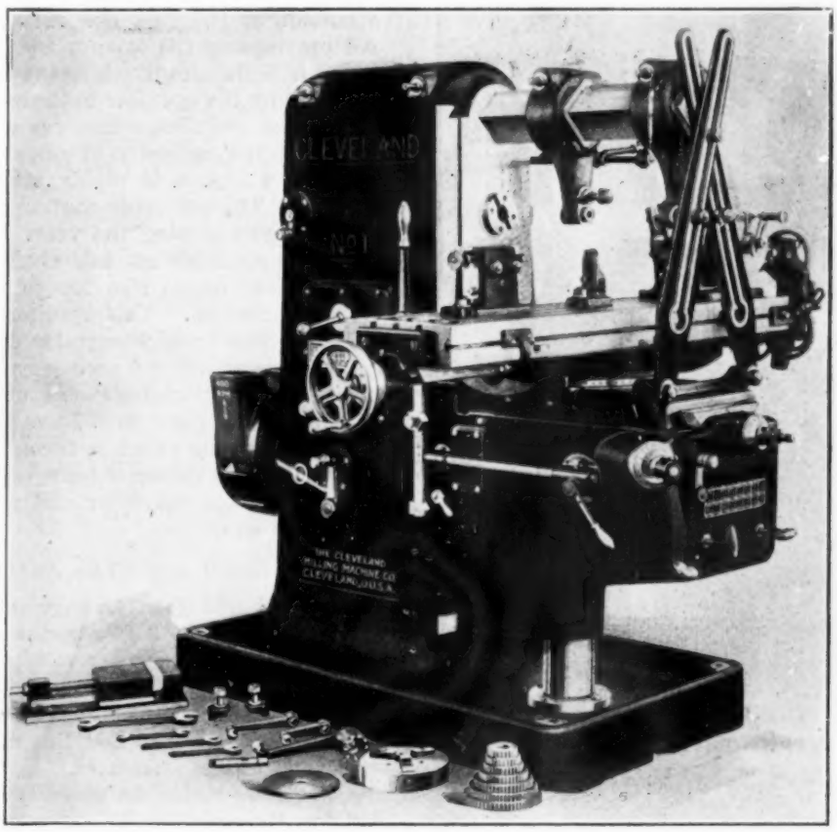


FIG. 1. NO. 1 CLEVELAND UNIVERSAL MILLING MACHINE

Table: Working surface, 44 in. x 12 in.; size overall, 44 in. x 12 in.; T-slots, three ⅝ in.; swivel, right or left, 50°. Range: Longitudinal, 22 in.; cross, 8 in.; vertical, 15 in. Full width, face of column to braces, 23 in. Index centers: Swing, 10 in.; take-in length, 24 in. Spindle, chrome nickel steel: Diameter of nose, 4¼ in.; diameter of bolt circle, 3¼ in.; thread bolts, evenly divided, 4⅞ in. x 12 thread; keyway, ⅝ in. x ⅜ in.; diameter front bearing, 2¾ in.; size taper B. & S., No. 10; size hole through, ¾ in.; spindle speeds, number, 16; spindle speeds, range, 13 to 350 r.p.m. Overarm square, 3½ in.; distance to center of arbor, 6⅛ in. Arbor supports, 2. Drive: Pulley, size, 12 in. x 3½ in.; pulley, speed, 400 r.p.m.; motor recommended, 5 hp. Feed: Number of feeds, 16; feeds, 0.312 in. to 14.37 in. per min. Miscellaneous: Vise (swivel base) jaws, 4 in. wide, 1¼ in. deep; with steel jaws, open, 4 in.; without steel jaws, 4⅝ in.; universal 3-jaw chuck, 6 in.; floor space, 70 in. x 60 in. Equipment: Spiral dividing centers, center rest, index plates, change gears, index chart, 3-jaw universal chuck, swivel-base vise, oil pump for lubricating cutters, and necessary wrenches. Shipping data: Net weight, 4600 lb.; domestic weight, 5100 lb.; foreign shipping weight, 5500 lb.

Designers of machine tools find the table and saddle of a milling machine a most trying problem, as these parts are subject to tortional as well as bending moments; therefore these must be designed to resist continuous strains and also maintain their original accuracy. The table of the Cleveland milling machine

is machined all over to insure proper alignment, as a table finished on one side only may warp. The bearings on the table are at the top of the saddle instead of at the bottom of the dovetail, a method which secures a large bearing surface and locates the bearings at a greater distance apart. These bearings are automatically lubricated by rollers in the saddle. The bearing on the saddle is also at its widest portion, and both saddle and table bearings are taken up with long taper gibs which are provided with adjusting screws at both ends.

The square overarm provides positive alignment of the arbors and maximum rigidity of the arm pendants.

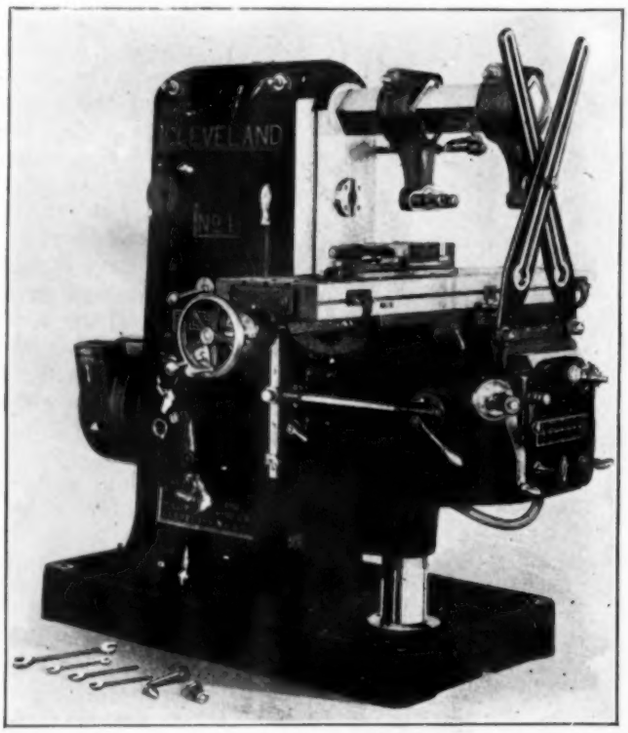


FIG. 2. NO. 1 CLEVELAND PLAIN MILLING MACHINE

Table: Working surface, 44 in x 12 in.; size overall, 44 in. x 12 in.; T-slots, three ⅝ in. Range: Longitudinal, 22 in.; cross, 8 in.; vertical, 15 in. Full width, face of column to braces, 23 in. Spindle, chrome nickel steel: Diameter of nose, 4½ in.; diameter of bolt circle, 3½ in.; thread bolts, four evenly divided, ⅞ in. x 12 thread; keyway, ⅝ in. x ⅝ in. deep; diameter front bearing, 2¾ in.; size of taper hole B. & S., No. 10; hole through spindle, ¾ in.; spindle speeds, number, 16; spindle speeds, range, 13 to 350 r.p.m. Overarm square, 3½ sq.; distance to center of arbor, 6¼ in. Arbor supports, 2. Drive: Pulley, size, 12 in. x 3½ in.; pulley, speed, 400 r.p.m.; motor recommended, 5 hp. Feed: Number of feeds, 16; feeds in inches per minute, 0.312 in to 14.37 in. Miscellaneous: Vise, jaws, 4 in. wide, 1¼ in. deep; with steel jaws, open, 4 in.; without steel jaws, 4¾ in.; floor space, 70 in. x 60 in. Equipment: Plain vise, belt guard, oil pump for lubricating cutters, and necessary wrenches. Shipping data: Net weight, 4200 lb.; domestic weight, 4700 lb.; foreign shipping weight, 5200 lb.

If the arbor is not exactly true and the arm pendant is brought into place by the operator to accommodate the arbor, the arbor is working in a cramped condition and may break. With the square overarm it is impossible for the operator to place the arbor supports on the overarm and on the arbor in any other way than exactly in line. This simple principle of the square overarm eliminates the possibility of any revolving movement of the pendant and also gives greater bearing surface in column and pendants.

The flanged spindle does away with the overhang on the end of the spindle as well as the trouble caused by cutters screwing fast on the spindle, and also allows the cutter to be run in either direction. On the flanged spindle is a face keyway, inserted into which are hardened steel jaws for driving arbors and face mills. It is unnecessary to remove these at any time to change from a face mill to an arbor, as the driving is done by the hardened steel jaws. The strain is, therefore, taken off the taper hole. The spindle is provided with a positive lock that enables the operator to loosen the arbor nuts with the least possible difficulty, and is also provided with a handwheel to revolve the spindle, a feature which the operator will find convenient on boring jobs and other milling operations. The spindle lock cannot be operated while the machine is running, nor can the main driving clutch be thrown in while the spindle lock is in this position. The bearings on both the front and rear of the spindle are taken up with a nut on the outside at the back end of the spindle.

All bearings in the column and knee are thoroughly covered with lubricant while the machine is running, thus relieving the operator entirely of the responsibility of oiling the most important parts of the machine and eliminating the necessity of oil holes in any of these parts. This system is highly efficient and is entirely automatic. The reservoir containing the oil has to be filled but twice during the year. As high-speed steel cutters are used almost entirely on milling machines, a reservoir of ample size for cutter cooling lubricant has been provided. This medium is circulated by a centrifugal pump which operates only when the spindle does; therefore, it is not necessary to shut off the cutter lubricant when changing work or when stopping the machine to measure it. This pump operates automatically when the clutch is thrown in and the machine is running, and supplies a heavy flood of coolant at low pressure to avoid splashing and permit its use in the most ample quantities.

Speed and Feed Arrangement

The speed and feed arrangements are both of the sliding-gear type. All 16 changes of speeds, as well as feeds, are made by two levers located conveniently for the operator. The spindle speeds are 16 in number, in either direction, and the feeds are 16 in number, in either direction also, so that this machine will efficiently handle all classes of cutters. Speeds and feeds being in geometrical ratio, the correct changes of speed and feed for the work to be done can be made without trouble. All gears and shafts in the drive, as well as the feed, are of hardened steel, automatically lubricated, running in bronze bearings, and protected against breakage by a safety device.

Power is transmitted through a constant-speed drive pulley and the machine is so designed that it requires no loose gears on the spindle. All shifting of gears is done on the secondary shafts below the spindle. The objectionable feature of the tumbler in both the main drive and feed works has been eliminated. The starting and stopping lever can be operated from both sides of the machine and the single pulley running at constant speed for the drive is protected by a belt guard, so constructed that it can be adjusted to any angle and any added extensions. The spindle reverse is contained within the machine so that right- or left-hand cutters can be used, and all the speeds, feeds and other driving mechanism are self-contained within the machine. All power gear shafts between the drive shaft and the main spindle are in a vertical line to eliminate all side thrusts in the column casting. These machines are manufactured by the Cleveland Milling Machine Co., Cleveland, Ohio.

∴ EDITORIAL ∴

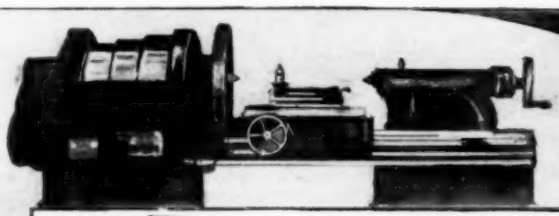
The Shelves of the World Are Bare

FOR fifty-two months billions of dollars' worth of created value in commodities were fed into the insatiable maw of war. For fifty-two months the world decreased or totally stopped the production of homes, schools, office buildings, public works of vital necessity, railroad facilities and machinery for peace-time uses, farm implements and fertilizers, and many other commodities, in order to build ships and cannon, make ammunition and uniforms. and to release our men for the business of war.

Now the shelves of the world are bare, and the demand for peace-time goods is earth-wide. Here is opportunity! An opportunity that requires for its capture neither more nor less than any opportunity requires, and that is work, energy, industry, confidence, unity and co-operation.

Opportunity is here! Let us get busy, and with the same faith and confidence and unity of action that helped to win the war, let us fill those shelves, and empty them, and fill them and empty them again!

With the quickening of exchange and production to replace the destruction and waste of war, prosperity will come to all. With confidence and faith in our ability and in each other and working *all together,* let us face these empty shelves.



Putting the Industry where

By Fred H. Colvin, Principal Associate

In pointing out the failure of the builders of industry, it is the desire of the author to make machines realize the part they play in the world's be suitable rewarded. The industry should opportunities for advancement and for service

WE HAVE known for years—and if we had not known, the war would have taught us—that the machine-tool industry is at the foundation of modern civilization. Without it we would have none of the thousands of things we count as necessary to modern comfort. We would use the scythe instead of the mowing machine, the sail instead of the turbine, and the horse instead of the locomotive, the automobile or the airplane. There would be no telephone, or telegraph, or wireless. Instead of the electric light we would still be using the pine knot or the tallow dip. The forked stick would still be used for plowing, and the locomotive and the modern stove would be unknown.

We have known all this, and yet we have not made it real enough to use this knowledge to place the machine-tool industry in the position to which it is justly entitled. We have bent our energines, both of brain and brawn, to devise and construct machines by which others have made fortunes, for the users of machine tools have secured rewards far in excess of those of their builders.

The machine-tool industry designed and built all the machinery which made possible large sewing machine and typewriter plants, the bicycle manufacturing establishments and the new automobile shops, which are now such an important part of our national industries. Yet in every case, the machine-tool industry has suffered because all of the other industries have in turn offered inducements which made it extremely difficult to keep the men interested in the machine-tool shop.

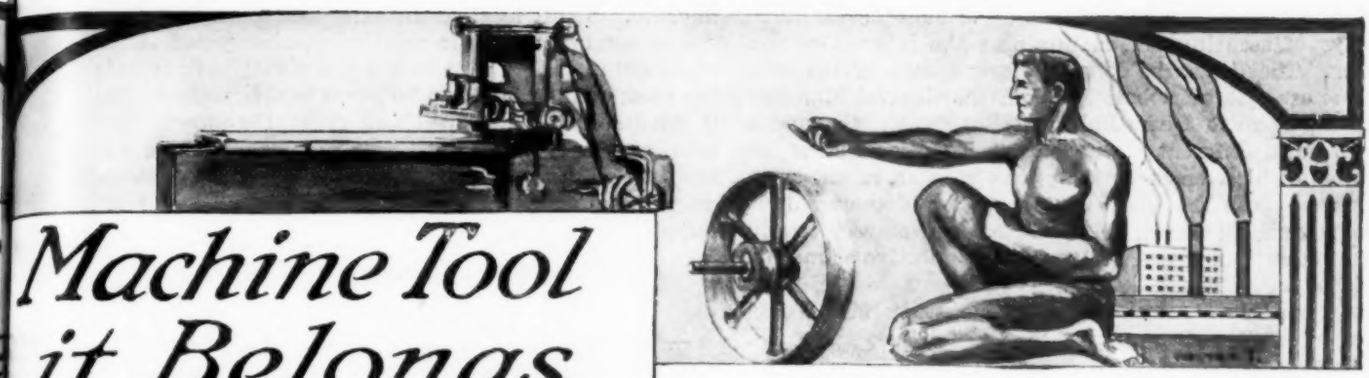
Stealing Young Men For Other Industries

The automobile shops, for example, were able to offer half-trained apprentices several times the wages paid at that time, and as a consequence robbed the machine-tool shops of many young men on whom considerable time and money had been spent in training. In the same way automobile shops secured the services of more men and superintendents of great value to the machine-tool industry. This not only resulted in much mental wear and tear on the part of managers of machine-tool shops, but we have no means of knowing to what an extent it discouraged highly desirable young men from entering the machine-tool field.

There is every reason why the machine-tool industry should have the pick of men of all ages. It can be made so attractive that every young man who is mechanically inclined will first think of the machine-tool building shop in his vicinity as the desirable place for his mechanical activities. There is a romantic side to the building of the machines which are at the bottom of all our civilization, that can be emphasized and made to appeal to all that is best in the mechanic of real ability. To have a part in the manufacture of the machines which make all other machines possible and without which they could not exist should be made to play its part in attracting the most desirable mechanics to this select branch of the machine-building industry. The higher the class of men we attract to the machine-tool industry the more highly perfected machines will be designed and built, and the result of this will be felt in every other industry. The fact that it must of necessity remain small in comparison with other branches of the machine-building trade, makes it possible to select the highest type of men in its various branches, assuming, of course, that all the conditions in connection with the industry are as good, or a trifle better, than can be found elsewhere. The very fact that it is so comparatively small in numbers makes this a task which should not be difficult considering the types of men to be found in these machine-tool lines. Shop conditions, wages and the matter of personal relation to the men and the management, are three of the questions to be considered, and there is every reason why these can be made more attractive in the machine-tool industry than in any other.

Wages Must Be Attractive

It has unfortunately been true that in many cases the mechanic in the machine-tool shop has received a lower wage than the man using the lathe or planing machine which he built, and this in spite of the fact that the machine-tool building machinist was a highly skilled mechanic while the other man often became only an operator of that particular machine. The reason for this is not hard to find, but that does not help the situation in the least, nor make the real machinist any more contented with his lot. The fact that the machine-tool industry is the oldest in the country, and that the concerns who use machine tools on a new product charge enough for their product to enable high wages to be paid, explains in most cases the reason for the difference, but it can hardly be expected to satisfy the man who has spent years in becoming a skilled machinist. Nor is there any reason why it should.



Machine Tool it Belongs

Editor, American Machinist

machine tools to appreciate their importance to both the builders and the users of these important progress and to demand that the services rendered attract the best designers and mechanics and should be at least equal to those in other lines.

Perhaps the fundamental reason for all this is that the average machine-tool builder has underrated the value of his product to his customer and to the country at large. He has in most cases built up a business from a small beginning, which made it necessary for him to consider every dollar's expenditure most carefully, and in too many cases has not realized the changes which have taken place in the industry at large.

The automobile manufacturer, on the other hand, has, with the exception of a few pioneers, started business with ample capital and has charged enough for his products to enable him to make wages attractive to all classes of men he desires to employ. Automobile builders spend money lavishly for machine tools and other equipment, because this cost can be distributed over a large output and can very soon be charged off the books, although he may continue its use for years.

The Real Value of Machine Tools

Machine-tool builders have overlooked the fact that, as the basic industry, they produce machines for a single profit on which the user profits day after day and year after year. The value of the machines to the consumer has not been computed on the basis of so many cents per pound as is too often attempted. Its real value is on the amount of product per dollar of expense for machines and labor which he receives from it. A special machine costing, perhaps, $2000, and on which the machine-tool builder makes 20%, or $400, if he is lucky, may save the purchaser the entire price of the machine every three months, and in so doing enables him to pay an unskilled operator double the wage received by the man whose skill was necessary in producing this special machine itself. This is not advocating a radical or unwarranted advance in prices, but is only for a careful consideration of the facts as they exist today. The machine-tool industry does not as a rule pay as high wages or salaries as some other lines of the machine-building industry, and until it does it cannot hope to attract the best men, which are so necessary for its future development.

In normal times the machine-tool industry employs less than 50,000 people out of a total population of 110,000,000 in this country. Even assuming that it paid 10% higher wages and salaries than other machine industries, this cannot affect but 50,000 workers out of our entire population. The fear that it may antagonize customers is practically groundless, as is the idea that it will disrupt the labor conditions of the entire country. It is well known that the Wall St. district in New York pays decidedly more money for its stenographers and clerical help than any other part of the city. It also has the custom of paying substantial bonuses in addition, but this by no means disrupts the employment situation in the entire City of New York. It simply gives the employers of this district the pick of the personnel, and, after all its positions are filled, applicants must go to the other business houses for positions.

Exactly the same condition applies in the machine-tool industry, for, like the Wall St. district, it is comparatively small and can in the same way secure the best talent to be obtained in the country. There is no reason why the machine-tool industry should not be at the head of manufacturing so far as the talents of its personnel and the attractiveness of the industry is concerned. But this is not all. There is another and equally important side to the question—that of securing the personal interest of all concerned.

The Best Industry in the World

The artist or sculptor is an enthusiast over his creations, yet they give pleasure to but a few. Machine tools make civilization possible and not only give comforts but even the bare necessities to the whole world. It is not only our right but our duty to be enthusiastic over our product and to pass this enthusiasm down the line; to make the men in the shop see and feel that they are engaged in the best industry in the world. What is more, we can make it the best in every sense of the word.

Can anyone doubt the advantage of having a shop filled with interested and enthusiastic men? We have all deplored the lack of interest in the modern shop, but we have overlooked the fact that we have in many cases taken the interest out of the work and made the man a part of his machine. We must put back the old interest or create new ones. Those of us who came up through the shop took a keen interest in the planning of the work and in the devising of new ways for carrying it out. How many of us would be interested in doing one operation, hour after hour, day after day and month after month, especially when everything was planned out for us in the office and we had no voice in it?

We are not going back to the old methods; specialization has come to stay, and it is up to us to devise other ways of securing and maintaining the interest of the men. That it can be done is clearly shown by the brilliant example of Robert B. Wolf, the General Manager of the Spanish River Pulp and Paper Co., who under two quite different circumstances has aroused the interest of his men in their work to such an extent as to increase both the quantity and quality of their output to an amazing extent. Mr. Wolf has proved very clearly that other incentives may be fully as effective as money, although the results he secures justifies a high rate of remuneration. All should read and study Mr. Wolf's paper on "Non-Financial Incentives" before the A. S. M. E. in December, 1918.

There are several points to be considered which may be summed up as follows:

1. Realize the importance of the machine-tool industry and make your enthusiasm in it extend to every man in the shop.

2. Demand a substantial return which will enable the machine-tool shop to be made as attractive as any other.

3. Institute real training not only for boys and new men but for all who are not highly efficient. This will do more to increase output and reduce costs than we realize.

4. Have a real personnel director who will not only direct employment but who can devise ways and means for securing and maintaining a live interest on the part of the men. Among the methods which might be employed for doing this are:

a. A real house or employees' paper for large shops. This is a difficult problem but is an excellent means of contact when rightly done.

b. Bulletins in each department giving news of interest to the shop, such as where machines are going, showing perhaps one of these lathes in use in South Africa or Australia or on a battleship.

c. Talks to the men to enthuse them on the product just as we do to the salesmen; to let them know the good points of the machines they are making. Opportunities for the men to inspect the machines and to have their families see what kind of work they do. A good workman takes pride in showing his mother, his sweetheart or his wife and family the kind of work he does; to point out the necessity of his making the spindle within a half-thousandth of the exact size. This increases his own pride in his work and also raises him in the eyes of his family who too often only think of him as a man who gets his clothes and hands very dirty every day. This increase of respect for his skill adds to his self-respect and is reflected in many ways.

d. Devise every way possible to make the men feel that they are really a part of the family. While this is the work of the director of personnel, he cannot do it alone. He must have the coöperation of every official to insure the proper relations with the men in the shop. Some shops are beginning to post bulletins showing the cost of the plant, of the equipment, the value of the output, and the cost of material and of labor, in percentage of the total, and other facts which impress the men not only with the fact that they are part of a good-sized business but that the firm is not afraid to be frank with them and has nothing to hide.

These are merely suggestions and can be modified and improved to suit local conditions. The main thing and the necessary thing is to get the men interested in the plant and in their work. It is not any easy task to undo the work of the past 10 to 20 years in this respect. But it can be done and it will well repay the effort. The benefit becomes evident in better relations, in more contented workmen, in lower labor turnover, in increased output and last but not least, in better citizens for the community and the country.

Indispensability

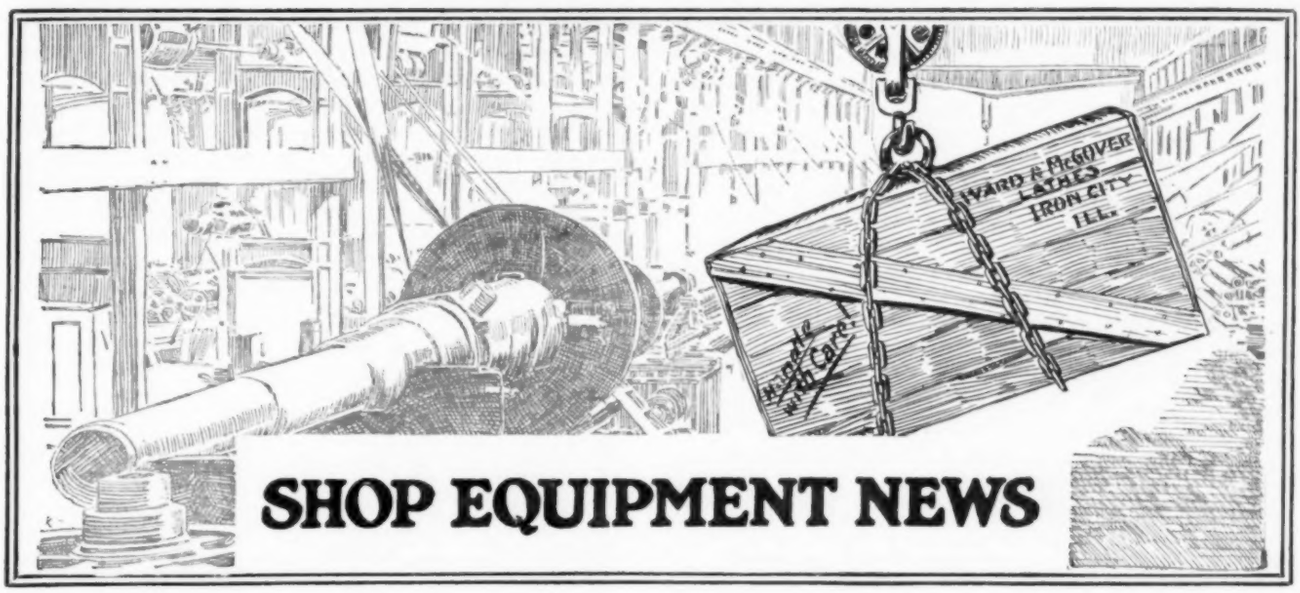
By A. Ellsworth

Mr. R. Blondin writing under the title "Indispensability" on page 520 of *American Machinist* presents an excellent example of the shortsighted manager who vents the irascibility, which is the perfectly natural concomitant of the always unexpected and unwelcome results of his own lack of judgment, upon the head of a poor "Andy" who, until the very moment he was fired for it, had evidently never been told that he was doing wrong. I don't know Andy by that name but I am acquainted with other members of his family. He generally has a swelled nut and firmly believes in his own indispensability, but this is rather the fault of his early employers than his own failing. He possesses, however, a faculty that under proper supervision is capable of rendering service of infinite value; a faculty which a wise manager should recognize and develop, at the same time endeavoring to repress features that might, under some circumstances, becomes undesirable.

Probably not one of these early "managers" knew enough about "man" to recognize the value of Andy's gift or the danger that is its inevitable companion. Not one of them had ever taken Andy to one side and kindly explained to him that while a good memory is a very valuable possession, there are certain adjuncts in the way of records, indices, filing systems, etc., with which it can be advantageously supplemented; that while he, Andy, knew a whale of a lot about the business there still remained numerous points which he had overlooked, and if he wanted to become really indispensable he should cop off some of them while the copping was good and set them down on paper so that he could transfer them to his wonderful memory at his convenience.

Instead of that the manager had probably bawled him out somewhat after the manner of the one noted by Mr. Blondin, and Andy quite naturally assumed that "the old man was jealous because somebody knew more about the business than he did"—indeed, he or some one of his brothers has told me just that. In my opinion the manager who fired Andy because he had a good memory and didn't know there was anything bad about it because he had never been told, is exactly on a par with the machinist who would smash up a perfectly good lathe because he couldn't see how he was going to turn a square shaft on it.

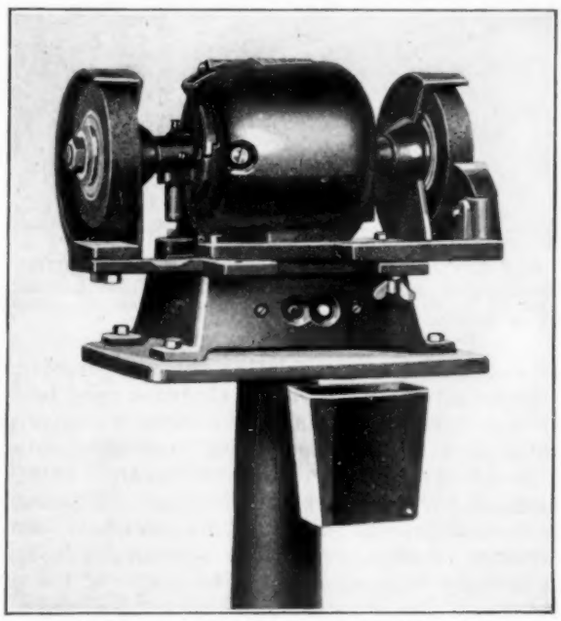
There have been marvelous developments in our field, not to mention others, in the past few years; there have been disastrous failures and disappointments as well. I wonder if, after all, some of us who are or have been directors of the activities of men should own up, would we not find that the credit for a considerable amount of this progress belongs to the man in the overalls or apron and at least a little of the trouble, a few of the mistakes, are chargable against us?



SHOP EQUIPMENT NEWS

Janette Electric Grinding Stand

The Janette Manufacturing Co., 617-625 West Jackson Boulevard, Chicago, Ill., and 149 Broadway, New York, is now marketing the electric grinding stand shown in the illustration, this being furnished in either bench or floor type as desired. The machines are identical except for the pedestal and can be furnished



JANETTE BENCH-TYPE GRINDING STAND

Floor type: Height, 46 in.; width, 14 in.; weight, 105 lb.; wheels, ¾ in. x 5 in. Bench type: Height, 10 in.; width, 14 in.; weight, 55 lb.; wheels, ¾ in. x 5 in.

for either 110 or 220 volts, d.c., or for 30, 50 or 60 cycles, 110 or 220 volts, a.c. The d.c. motors are of the compound-wound type, of 3500 r.p.m. and ¼ hp. Electrical connection can be made to any lamp socket, an extension cord being furnished, and a switch being located in the base of the grinder. This is of the push-button type and can be seen in the base of the machine. The spindles are made from 90-point carbon steel, hardened and ground to size, and the bearings of hard-drawn phosphorus bronze SKF ball bearings being furnished at an extra charge. Lubrication is of the grease and wick-pattern type with an oil cup on the upper bearing, and the bearing arranged with the oil return holes leading back into the oil well. Wheel mountings are of standard dimensions, and the flange washers are machined all over in order to insure balance. The inner flanges are keyed to the spindle and can be removed if desired. The wheel guards protect the grinding wheels for two-thirds of their circumference. Adjustable grinding rests are furnished and held in position by means of a clamping bolt and a wing nut in a T-slot. They may be removed if desired. The water pot at the front of the machine is detachable.

Arcwell Welding Apparatus for Alternating Current

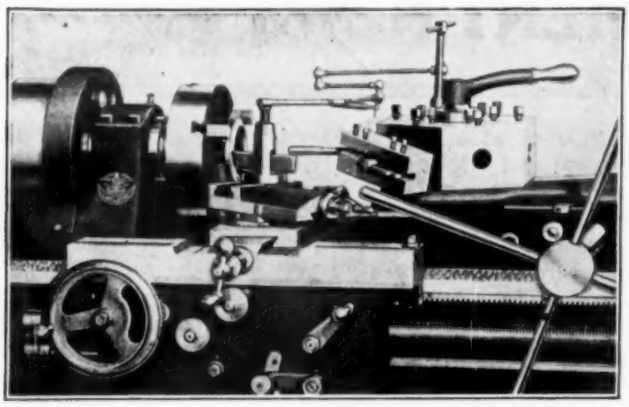
The Arcwell Corporation, 42 Broadway, New York, has just placed on the market a new electric welding machine built for operation on alternating current of any specified voltage or frequency. It differs from the company's standard machine in that it is being put

ALTERNATING-CURRENT WELDING APPARATUS

out expressly for the use of smaller machine shops and garages, its capacity not being sufficient to take care of heavy work on a basis of speed. It will do any work that can be done by the larger machines, but the work cannot be performed as rapidly, the machine being intended expressly for use by concerns who have only occasional welding jobs to perform. The machine weighs approximately 200 lb., and being mounted on casters, it can be moved from one job to another.

Cincinnati Turret Attachment

The illustration shows a new attachment that has just been placed on the market by the Cincinnati Lathe and Tool Co., 3207-3211 North St., Oakley, Cincinnati, Ohio, for use in connection with its regular line of engine lathes. This hexagonal turret is designed for various



CINCINNATI HEXAGON TURRENT ATTACHMENT

types of work and is shown machining a bevel gear 5½ in. in diameter, 1¼ in. wide, having a 1⅜-in. x 1½-in. hub, through which a ¾-in. hole is bored. The lathe shown is supplied with a pan, a pump, a turret toolholder in compound rest, double back gears and hexagonal turret on the bed, together with power-feed.

"Hack" High-Power Universal Relieving Machine

The "Hack" high-power, universal relieving machine shown in the illustration is one of the latest products of the American Machine Tool Engineering Works, Chicago, Ill. The machine is made with capacities of 6, 10 and 16 in., and is said to be of very massive and rigid construction. The pan and legs are cast integral, the pan being close to the floor in order to allow plenty of room for the proper width and breadth of bed. There are two sets of ways, one upon which the head and tailstocks are aligned, while the second set is used in connection with the first set to carry the carriage. The second set of ways is also used for aligning the side-relieving attachment. The lead screw is located in the center of the rear set of ways upon which the carriage slides, which is said to permit the movement of the carriage with a degree of positiveness that is not obtainable when the power is transmitted through the apron.

The headstock is said to contain a number of new features, some of which are radical in design. A countershaft forms a part of the head itself, and power is transmitted to the machine directly from the line-shaft or jackshaft through one forward and one reverse belt direct to the machine without idlers of any sort. Power is transmitted from the pulleys to the head through a Carlisle-Johnson friction clutch, and to the spindle through spur gearing, the majority of which is made from 60-point-carbon-steel forgings. Speed changes are obtained by sliding gears controlled by five levers, the gearing running in a bath of oil to insure proper lubrication. The spindle and other bearings are equipped with sight feed oil cups. On the end of the machine are two quadrants, one for change gears for such leads as may be desired up to approximately 6 in., the other controlling the cam-driving shaft that extends along the back of the

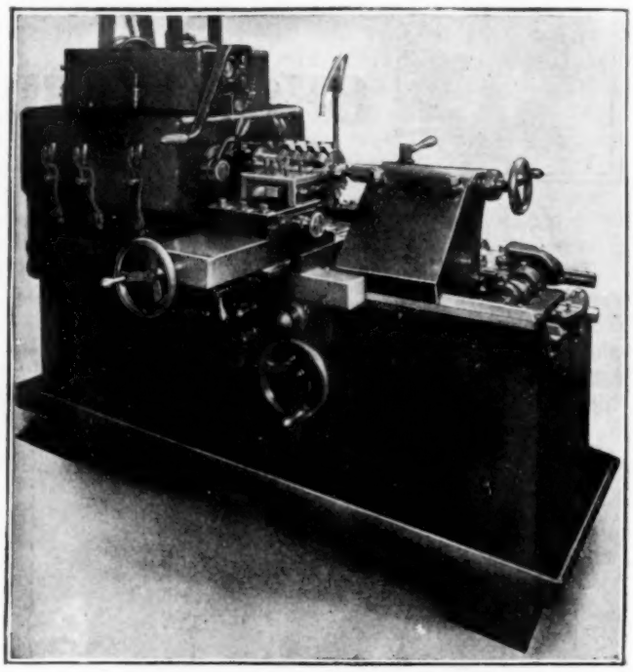


FIG. 1. "HACK" UNIVERSAL RELIEVING MACHINE
Specifications for 16-in. machine: Weight, 8000 lb.; capacity, cutters 14 in. in dia. up to 16 in. long; speeds 9; diametrical pitch of teeth in bull gears, 4.

machine, these gears regulating the number of gashes or the spiral of the gash, as the case may be. The rear cam-driving shaft is driven through change gears from a stud in the rear of the headstock, obtaining its power directly from the bull gear. This shaft rotates at six times the spindle speed. By means of a ratchet dog arrangement on the camshaft, the cam movement is suspended while reversing the spindle, and is ready to again take up its motion at the proper point when the spindle again moves forward. This cam-driving shaft extends the entire length of the machine, being supported in bearings at both ends, and from it is taken the power to rotate the cam arbor-driving mechanism at the back of the carriage, as well as the driving mechanism for the side-relieving cam, the adjustments being such that it is possible to time the two cams together or otherwise, as may be desired. The side-relieving attachment causes the entire carriage to move while the regular relieving attachment causes the cross-slide only to move.

The carriage cross-slide and compound-slide are heavy, and the tool block, which in itself is a horizontal slide, is made of cast steel, carbonized, hardened

and ground on all working surfaces. This construction permits the use of micrometer adjustments when required, and a device is incorporated to lock the block securely in place. A safety device inside of the headstock prevents the carriage from being run against the headstock by accident; a second safety device in the tailstock prevents the carriage running into the tailstock.

The tailstock is made in one piece, and when taper relieving is handled, a special spindle with offset center can be furnished. The carriage is moved by a rack and pinion mechanism within the apron. A special mechanism is incorporated to provide for concave relieving, the purpose of which is to relieve the barrel effect resulting in all hobs and cutters being more than several inches in width as the result of hardening. The arrangement of this feature is such that where three hobs or more of a kind are placed upon the relieving arbor, each hob can be produced with a concave contour corresponding exactly in curvature and depth with that of the other hob in that set, or where only one large hob is being made, the curvature can be distributed in its proper form over the entire length of the long hob. This curvature is controlled entirely from the mechanism within the apron, and can be readily adjusted and set for any desired length or depth of curvature. The machine is completely universal, capable of relieving spiral or straight gashed hobs, plain form cutters, counterbores, either left or right-hand, as well as internal relieving on special tools when such may be required.

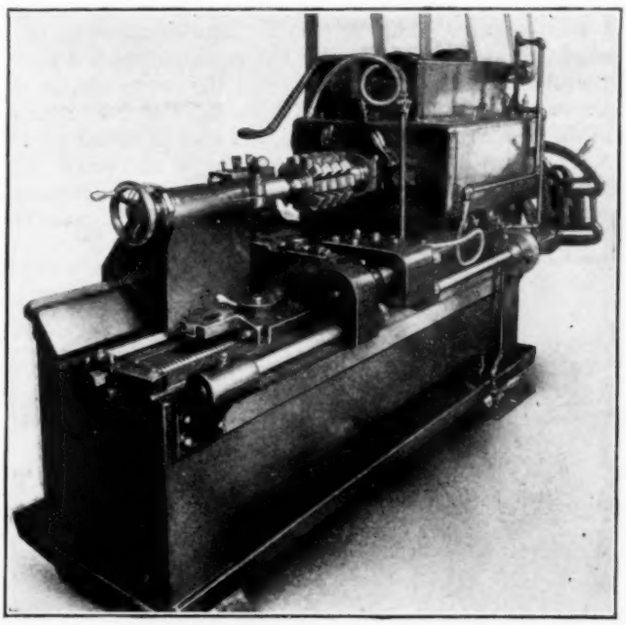
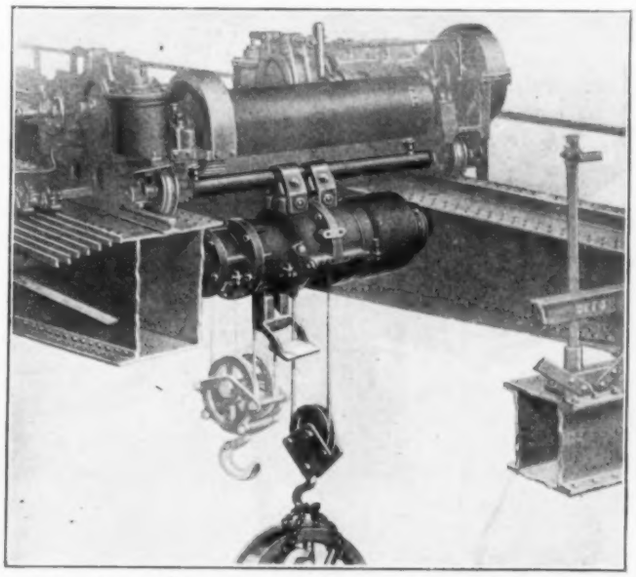


FIG. 2. REAR VIEW OF "HACK" UNIVERSAL RELIEVING MACHINE

Payne Auxiliary Electric Hoist

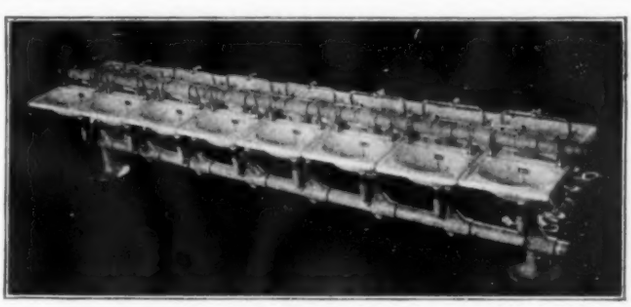
One of the disadvantages of the ordinary overhead traveling crane for heavy work is that a large percentage of the work handled is often far below the capacity of the crane with the result that the handling speed of the light pieces is rather low. To obviate this difficulty the N. B. Payne Co., 25 Church St., New York, is now marketing an auxiliary electric hoist that is intended to be installed on the regular traveling crane for handling light loads. The hoist is made up to suit the various requirements of the customer and is made ordinarily in sizes up to 5 tons, but special hoists of larger size can be furnished if desired. The hoist does not take any more headroom than the regular crane, does not require an extra trolley, and does not shorten the travel of the trolley on the bridge, nor does it interfere with the accessibility of the main hoist. The advantages claimed are, saving in power over the use of the main hoist and the saving in time required in handling of light loads. The hoist is hung from an axle on the hoist carriage and is equipped with oilless lubricated bearings.



PAYNE AUXILIARY HOIST INSTALLED ON AN ELECTRIC TRAVELING CRANE

Manufacturing Equipment Factory Washbowls

The Manufacturing Equipment and Engineering Co., Framingham, Mass., is now manufacturing the type of factory washbowls shown in the illustration. These have a common water-supply, common waste, and common vent, each bowl being trapped and vented. The bowls are furnished in either single or double batteries as the user may desire. The illustration shows a double battery, there being a row on each side of the middle line of the structure. Each pair of bowls is trapped into an upright pipe which in turn connects vertically with the common vent that is formed by the large pipe

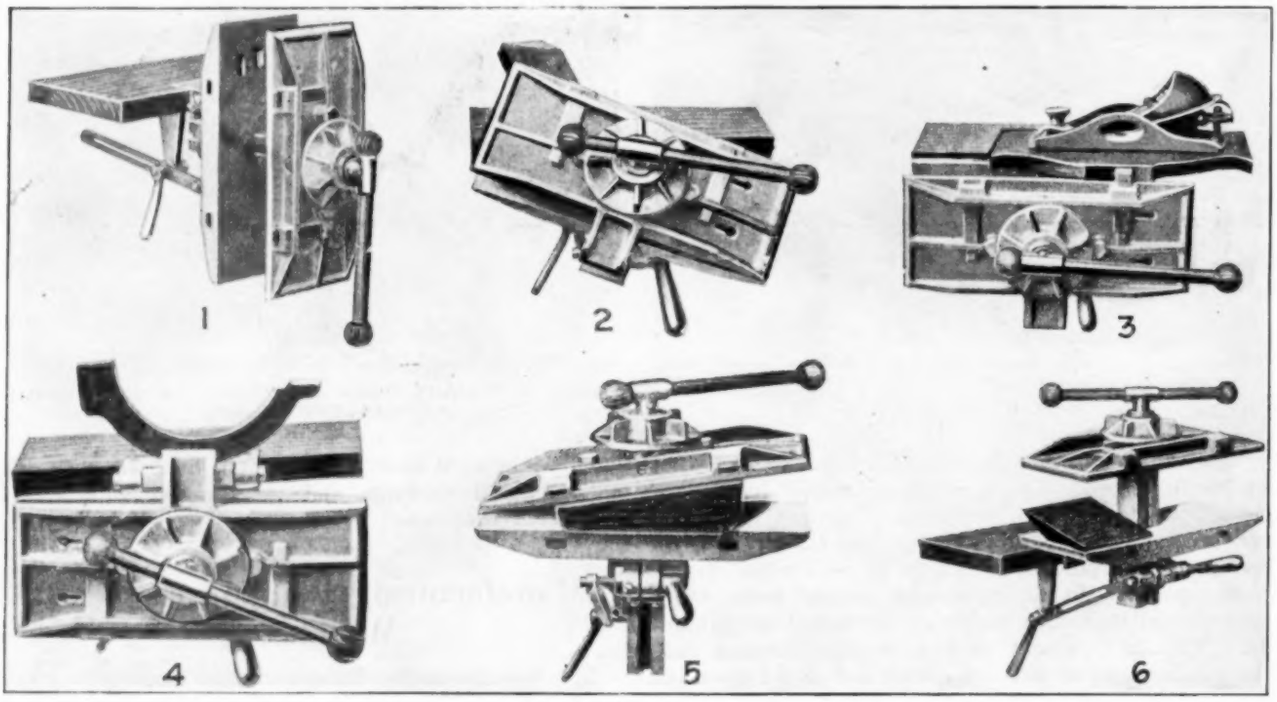


FACTORY WASHBOWLS

at the top of the apparatus, this being supported by hollow cast-iron pipes extending from the top to the bottom flanged feet of the apparatus. There is a hollow upright casting for each set of two bowls, each casting being one piece with two traps, one on each side, extending below the waste or bottom pipe in the apparatus. The bowls shown are piped for hot and cold water but can be furnished for water of one temperature if desired. They are made with plain cast iron, galvanized iron, or vitrified porcelain enameled bowls, and are shipped completely assembled.

The "Victor" Vise

A new woodworkers' vise called the "Victor" has been placed on the market by the Victor Tool Co., Waynesboro, Penn. The jaws are 7 x 18 in. with an opening of 15 in. and are smoothly finished for fine woodworking. It is claimed that the vise will hold all classes of work in almost any conceivable position. The figures illustrate some of the various uses to which the vise may be put. It has only 15 parts and its weight is 75 lb.

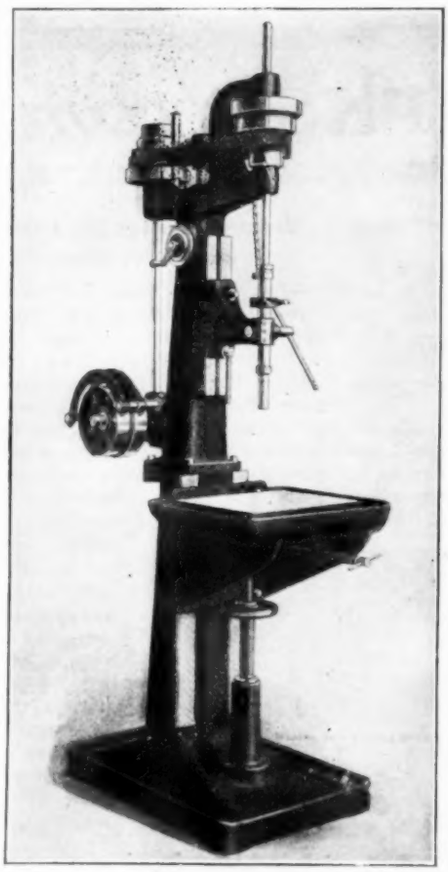


THE "VICTOR" VISE

Fig. 1—Jaws swung into position for work above the bench level and rack bar for raising or lowering jaws. Fig. 2—One of the many positions in which the vise can be set for handling work of irregular shape. Fig. 3—Holding-dogs in position for grasping thin pieces for surface working. Fig. 4—Jaws for holding metal parts. Fig. 5—Setting for wedge-shaped pieces showing adjusting collar and clamping lever for revolving jaws. Fig. 6—Upright position with tilt or angle jaw in place.

Edlund Sensitive Drilling Machine

The illustration shows one of a line of sensitive drilling machines that are being manufactured in the 1-, 2-, 3-, 4-, 5- and 6-spindle type by the Edlund Machinery Co., Inc., Cortland, N. Y. These machines are of the quick-change, high-speed, ball-bearing sensitive type, the operator making all speed changes from the working position without stopping the machine. Ten ball bearings are used for each spindle and it is said that the bearings used throughout are extra large. The power is transmitted from the drive pulley through two bevel gears and a vertical shaft to the rear four-step cone pulley, from which it is carried by a straight endless belt to the forward cone driving the spindle, this arrangement eliminating the quarter-turn belt. The spindle is of high-carbon steel, turned and ground to size and is provided with two driving splines on opposite sides. The spindle and cone pulleys are balanced to eliminate vibration. An oil reservoir at the top of the spindle contains sufficient oil so that frequent oiling is unnecessary. The spindle is counterbalanced by a weight located inside of the column and has a covered or protected ball thrust bearing at the lower end of the sleeve. The spindle sleeve is made of cast iron reamed inside and ground on the outside and is fitted at the upper end with an adjustment to take up end wear. The sleeve has a spline in full length to assure accurate meshing between the rack and pinion teeth, and two adjusting screws are provided to take up the wear in this bearing. A locking screw is also provided which locks the adjusting screws and keeps the spline in position. A stop collar and an adjustable depth screw are also provided. The sliding arm has a 9-in. bearing on the column and is fastened by a bolt at the upper end. This bolt is so adjusted that the raising and lowering of the arm is accomplished by simply unlocking the clamping lever on the lower end of the arm, making the use of a wrench unnecessary. The bevel driving gears are contained in the gear case and are made of steel, packhardened with planed teeth. The splash system of lubrication is used and provision is made to take up the wear in the ball bearings. Four speed changes are provided, the belt running in a shifting device operated by a rack and pinion controlled by a handle at the left side of the machine within reach of the operator. An adjustable idler is provided to take



EDLUND SINGLE-SPINDLE SENSITIVE DRILLING MACHINE

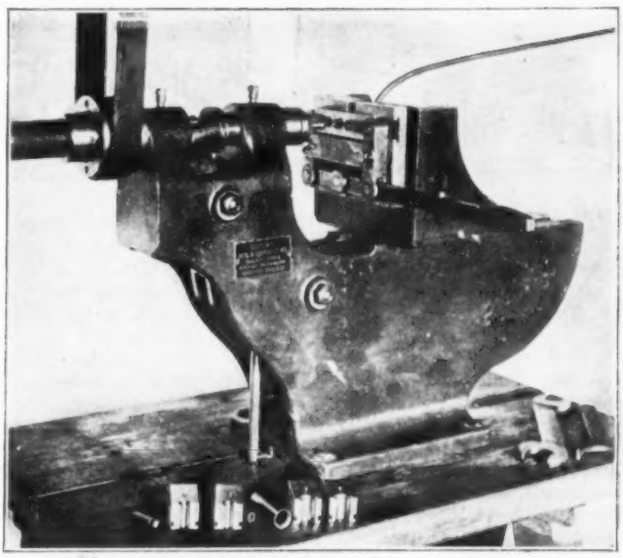
Maximum distance from spindle nose to table, 32¼ in.; diameter of spindle, ⅞ in.; diameter of spindle nose, 1⅞ in.; taper in spindle, Morse No. 2; vertical traverse of spindle, 6¼ in.; vertical traverse of arm, 9¼ in.; vertical traverse of table, 16¼ in.; diameter of drive pulley, 9 in.; width of drive belt, 1¾ in.; width of spindle belt, 1¼ in.; face of column to center of spindle, 8 in.; distance between spindles on multiple machine, 9¼ in.; working surface of table, 14⅛ in. x 16, 25¼, 35, 44¼, 54, or 63¼ in. in length for one to six spindle machines respectively; outside dimensions of table, 19 in. x 21, 30¼, 40, 49¼, 59, or 68¾ in. for one to six spindle machines respectively; weight, 825, 1100, 1400, 1850, 2400, or 2750 lb. for one to six spindle machines respectively.

up slack in the belt. The table is supported by a telescopic screw, the back part being raised to protect the ways on the base. The chip groove is said to be extra large and is so designed that it can be easily cleaned. The gib is fitted with two adjusting screws and two locking screws to insure ease in adjusting.

Grant Tube-End Spinning Machine

The Grant Manufacturing and Machine Co., Bridgeport, Conn., has developed and placed on the market a spinning machine, intended for flanging the ends of brass and copper tubing, such as used for connecting brass or copper pipes to carbureters and oilers for automobiles, aircraft engines, motor boats, or copper coils for hot-water heaters. A quick hand-clamping arrangement is attached to the table or knee of the machine for holding the tubing securely in position while the flanging is being done. This clamping arranging is so designed that the gripping jaws can be removed and others inserted for different sizes of tubing.

The machine will flange tubing from the smallest up to and including 1 in. in diameter, and the output from the machine will depend entirely upon the operator, as it requires only a second's time to form a perfect flange on the end of the tubing.



GRANT TUBE-END SPINNING MACHINE

It will also be noted from the illustration shown that the machine is mounted upon a bench in a horizontal position which will permit the flanging of pipes of any desired length. The flanging is done through the medium of a foot treadle thus leaving the operator's hands free to manipulate the work. The machines are arranged for either belt or motor drive.

National Metal Trade Program

Following is the program for the 21st annual convention of the National Metal Trades Association to be held at the Hotel Astor, New York, during the week of Apr. 21: Monday, the executive committee and local branch secretaries will hold their meetings, followed by a dinner in the evening to the administrative council and secretaries. On Tuesday, the secretaries will continue their meeting and the administrative council will also meet. Tuesday evening, the alumni dinner will be held and on Wednesday the convention will take place. The program in the morning will consist of the reports of president, John W. O'Leary; treasurer, F. C. Caldwell; commissioner, John D. Hibbard, and secretary, Homer D. Sayre, followed by the report of the Committee on Industrial Education presented by the chairman, Harold C. Smith, Illinois Tool Works, Chicago. Harry F. Atwood will then address the convention on "Our Constitution, the Antidote for Bolshevism." At the Wednesday afternoon session, Frank Jewel Raymond, East Orange, N. J., will speak on "The Dust in Industry," Hon. William C. Redfield on "Work of the Department of Commerce and Its Relation to Business," Howard Coonley on "Problems of Shipbuilding," Rev. Dr. Charles Audrey Eaton on "Industrial Democracy." The convention banquet will take place in the evening, John W. O'Leary, president, presiding. The speaker of the evening will be Senator James E. Watson of Indiana. The Thursday morning session will be devoted to an open and informal discussion, by the members present, of recent important industrial tendencies. This will be followed by the reports of the convention committees, report of the nominating committee, and the election and installation of officers for the coming year. The incoming administrative council will meet immediately following the adjournment of the convention.

Sparks from the

The High Shipping Rates

Representatives of American Manufacturers in Europe Subject to Loss Through Ocean Freight Rates Recently Announced

A well known and responsible correspondent of the *American Machinist* writes: Foreign dealers representing American manufacturers are being subjected to material losses in handling our goods, due to the fact that they have sold goods over there at delivered prices, basing their selling price calculations on the ocean freight rates recently announced by the Shipping Board. When it comes to a showdown, large quantities of our products have been shipped at exceedingly high rates as compared with the announced rates of the Shipping Board, for two reasons, first—because the goods had to be delivered in a certain time under penalty; second — because the Shipping Board, by not giving the service at the reduced rates, forced these agents to accept shipments at comparatively exceedingly high rates. Where the agents are compelled to deliver at the high rate, due to terms of sale they have lost money pushing American goods, instead of making money, with the result that many large contracts for American goods have been cancelled.

While in New York, I saw one cable from Spain which cancelled every American order, stating clearly that they could not accept further shipments with the overhead charges as they exist today, this cable indicating that their competitors were securing material at much lower delivered cost price.

This situation is detrimental in the extreme, when it comes to the foreign dealer wishing to place stock orders for future sale. Naturally, no sane dealer is going to stock up on American goods and have a large percentage of his profit tied up in ocean costs. If the shipping rates were more reasonable and staple, he would be more inclined to take a chance, principally for the sake of having goods for prompt delivery, and consequently make quick sales, but under present conditions, stock orders are hard to get.

It is needless to point out what the Shipping Board rates to Belgium and Spain have been within the last few weeks, and what the other lines have done to the rates when they realized that the Shipping Board was not giving the service.

While this situation has greatly affected the writer's own foreign business, yet he is only one of the many in this district who are crying for relief, and in the name of the foreign traders I ask that the powerful influence of the National Foreign Trade Council be brought to bear to bring about relief, not in a year, but immediately, if we are to keep our businesses going, keep labor employed and give jobs to the boys who have come back home and who expect us to take care of them.

1848
1917
IN HONOR OF WILLIAM LODGE
WHOSE KIND HEART AND HELPING HAND WILL ALWAYS
BE REMEMBERED THIS TABLET HAS BEEN PLACED HERE
BY HIS GRATEFUL EMPLOYEES

Bronze tablet recently placed on the wall in the Lodge & Shipley Machine Tool Company's shop by the employees, as a memorial to the late William Lodge. Clement J. Burnham a sculptor of Cincinnati, is the designer

* * *

Employment of Discharged Soldiers as Civilian Guards

The attention of all concerned is called to the desirability of employing discharged soldiers as civilian guards at places where such guards are required. The civil service regulations permit of preference being given in such cases to the employment of men who have had service in the United States Army. The training which these men have had was such as to especially fit them for the work of guards and watchmen. The employment of civilian guards, as that of other civilian employees of the Ordnance Department, should be taken up with the Civil Service Commission.

Wants Bids for Mail-Carrying Aeroplanes

The Post Office Department has issued specifications for multimotored aeroplanes of strictly commercial type and particularly adapted for the carrying of mails. The specifications are general in their terms and are designed to allow aeroplane builders the widest latitude of design and construction to give the performance required for carrying the mails. They are the result of a symposium of views of pilots, aeroplane mechanics, aeronautical engineers and practical aeroplane builders on what should be the qualifications of a practical commercial plane. Consideration will be given to a plane of two, three or more motors connected on one shaft or set in the wings or central fuselage, or both, and carrying a minimum of 1500 lb. of mail. While the needs of the department are preferably for a plane carrying a ton or 1½ tons of mail, consideration will be given to a machine of 1500 lb. What the department especially desires is an aeroplane of the lowest possible landing speed, whether that speed is structurally inherent in the machine or accomplished through mechanical devices, and a cruising speed of between 90 and 100 miles an hour, with a top speed of between 110 and 115 miles and a cruising radius of about 6 hours with normal load prescribed. A serviceable ceiling of at least 15,000 ft. is wanted. If the planes are built around Liberty or Hispano-Suiza engines the department will furnish the motors.

According to the views of postal officials, a plane with a mail-carrying capacity of 1½ tons, with a six-hour cruising radius, should not exceed 100 ft. in the wing span. Engines if placed in the wing must be made accessible with safety to the mechanic for minor repairs in the air. Each engine is to be equipped with independent and, as far as possible, fuel gas, oil and ignition systems to minimize engine failure.

The bids are to be opened on June 2 and it is expected that planes will be ready for delivery within six months.

World's Industrial Forge

By E.C.Porter
News Editor

American Business Preparing Constructive Suggestions

A preliminary outline of the program for the Seventh Annual Meeting of the Chamber of Commerce of the United States, to be held at St. Louis, Apr. 28 to May 1, as given out at the chamber's headquarters here, discloses that American business is preparing to offer constructive suggestions with respect to the future relations between government and business.

Having the advantage of experience gained during the war and during a five months' period of industrial readjustment, business men now are in position to give advice from their point of view on some of the important questions that are agitating the country. The meeting, coming as it does on the eve of an extraordinary session of Congress, furnishes an opportunity for obtaining a composite opinion from the business world on many things that Congress will take up.

Will Call Meeting of Chairmen

A very large part of the things that Congress will be called on to consider touch industry and business at some point. At St. Louis the representatives of business from 48 states attending the meeting will express their views not only as to policies and principles but will advance detailed programs as to carrying them out.

A call has been sent out asking a meeting at the time of the convention of the Advisory Council of American Industries, made up of chairmen of the nearly 400 War Service Committees named under the chamber's direction during the war to represent industry before the Government. These men will come together for the first time since the first of the year, when they met at New York to form an organization to perpetuate the War Service Committees.

Subjects for Discussion

The subjects for discussion and action at St. Louis include the disposition and operation of the country's railroads and merchant marine; proposed revision of anti-trust legislation; the future of public utilities; foreign relations and foreign trade, agriculture; industrial production; domestic distribution; waterways and highways; industrial relations; international commercial arbitration; finance and the Victory Loan.

The chamber is obtaining the services of the best authorities of the country as speakers and those who will deliver addresses include Carter Glass, Secretary of the Treasury; William C. Redfield, Secretary of Commerce; Edward N. Hurley, Chairman of the Shipping Board; Walker D. Hines, Director of Railroad Transportation; Senator Albert S. Cummins; George Ed. Smith, President of the Manufacturers' Export Association, and others.

The French government is sending to the meeting as speaker a special representative in the person of Maurice Casenave, formerly French M nister to Brazil, who comes to the United States as Director General of the French Services in this country, succeeding the French High Commission.

* * *

Export Association to Give Luncheon in Chicago

Following the custom set last year in Cincinnati, the American Manufacturers' Export Association will tender a luncheon to all members who may be in attendance at the National Foreign Trade Convention in Chicago, Apr. 24-26, 1919.

The luncheon will be held in Congress Hotel at 12:30 p.m. on Friday, Apr. 25th, and will precede the Group Session on "Direct Selling" which begins at 12:30 p.m. in the same hotel under the association's auspices. The speakers will be Alba Johnson, president Baldwin Locomotive Works; E. M. Herr, president, Westinghouse Electric and Manufacturing Co.; C. E. Jennings, president C. E. Jennings Co.; W. B. Campbell, president, Perkins, Campbell Co., and Mr. George Ed. Smith, president Royal Typewriter Company, all former presidents of the association.

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Outlines the Machinery Needed By French Nation

The agricultural machinery needed by France, according to George Ford, head of the Red Cross reconstruction work in Paris, is of the following varieties: 81,000 plows, 56,000 cultivators, 30,000 mowing machines, 115,000 farm wagons, 88,000 harrows, 50,000 rollers, 48,000 hoes, 36,000 seed drills, 13,000 fertilizers, 16,000 beet extractors, 21,000 winnowing machines, 18,000 horse-drawn rakes, 32,000 reapers and binders, and 53,000 root cutters, besides other farm implements.

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Uncle Sam's Resources

From United States reports we learn that we represent but 6 per cent. of the world's population and own but 7 per cent. of the world's land. But we produce 70 per cent. of the world's copper, 66 per cent. of the oil, 75 per cent. of the corn, 60 per cent. of the cotton, 33 per cent. of the silver, 52 per cent. of the coal, 40 per cent. of the iron and steel, 20 per cent. of the gold, 85 per cent. of the automobiles, 25 per cent. of the wheat and we operate 40 per cent. of the world's railroads.

Federal Association Formed

Its Purpose Is To Facilitate and Hasten The Liquidation of Cancelled War Contracts.

The Federal Liquidating Association, with local offices at 84 State St., Boston, Mass., Room B, has been formed to facilitate and hasten the liquidation of reduced, suspended, terminated or cancelled war contracts.

Thousands of contracts have been suspended by the Government in the midst of performance. Commercial contracts were never broken in such sudden and wholesale fashion and there is little precedent to guide. The tedious processes of litigation must be avoided. Settlement must be made just as the contracts were made—by newly negotiated settlement agreements fair to the Government and to the contractor. But this negotiation cannot proceed with the freedom of private business. The governmental administrative organization is bewildering, especially in respect of this new and unprecedented situation and procedure.

The advantage of system and coöperation in dealing with the Government was very clearly and thoroughly shown by the Association of Manufacturers of War Material formed early in January to insure the enactment of a satisfactory bill validating informal war contracts and to obtain a modification of the ruling of the War Department affecting settlements with sub-contractors. Both objects were attained. Considering the highly important legislation that failed of passage, the value of the work done by the association in its first task cannot be minimized.

The essential idea of the new plan is to secure the services of the best men for the work and to create an organization which will make their services available to all contractors.

Brig. Gen. Hugh S. Johnson will be president of the association. He was the man selected by General Crowder to prepare a plan for the execution of the draft. The plan was revolutionary, but its simplicity and practicability so commended itself to the War Department that it was adopted and General Crowder entrusted General Johnson with its execution.

The greatest difficulty in presenting claims lies in estimation and accounting. Figures must be set up in precise accord with departmental regulations. Col. R. H. Montgomery will have charge of the accounting for the association. Colonel Montgomery was General Johnson's chief adviser in accounting matters during the war. He was a member of the War Department Board of Appraisal and of the War Industries Board Price Fixing Committee. In these capacities he had a wide contact with

American business and industry and with all departments of the Government, and his work has been highly commended by all who are familiar with it.

The new association has also secured the services of a carefully selected personnel, familiar through service in governmental bureaus with departmental methods and with war contracts.

The officers of the Association of Manufacturers of War Material who share in the direction of the affairs of the new association are W. S. and C. J. Symington and H. H. Dinneen. These gentlemen add to an intimate association with all departmental agencies, acquired during the war and in the work of the old association, a wide experience in governmental contracts. They bring to the direction of the association the practical point of view of interested contractors. W. S. Symington is general counsel for the Symington interests. He was chairman of the Association of Manufacturers of War Material. C. J. Symington is president of the Symington Machine Corporation and has been the Washington representative of the Symington interests during the war. As such, he derived an intimate knowledge of departmental geography, methods and precedure, and of war contracts. Mr. Dinneen has been actively engaged in Washington in a legal capacity during the war. As secretary of the old association of the 75-mm. Shell Association, the American Fuse Maufacturers' Association, and the Committee on Boosters and Adapters, he has acquired familiarity and contact with the departments and has gained wide acquaintance among manufacturers.

Organization and Plan of the Association

The Washington headquarters of the association will keep in close contact with the various governmental departments, presenting the contractors' point of view generally, and, more particularly, attending to the expedition and presentation of all matters pending before any departmental agency.

Local offices have been established at each of the following points selected because of their convenience to local boards of adjustment: New York, Boston, Philadelphia, Baltimore, Rochester, Bridgeport, Pittsburgh, Cleveland, Detroit, Cincinnati, Chicago and St. Louis. Each local office has a business manager, an accounting and engineering department, a local counsel and a competent office personnel.

The plan of having accounting, engineering and legal departments is not intended to restrict the use by contractors of their own experts in these lines. The personnel of the association for this service is selected with special reference to its instruction and competency for departmental work.

The system of local and Washington offices enables business to be rapidly despatched and energetically followed from its inception locally, through the Washington departmental organization, to final settlement and payment.

R. W. Belcher Gets New Position

R. W. Belcher, who has been especially identified with civil service work, has been elected secretary of the War Service Executive Committee of the Chamber of Commerce of the United States, of which Joseph H. Defress, of Chicago, is chairman.

Mr. Belcher takes up the work which was inaugurated by W. H. Manse, whose present work is in connection with executing the detail of interest to the War Service Committees which are to meet at the annual convention of the Chamber of Commerce of the United States, to be held in St. Louis.

Mr. Belcher has been serving for a year and a half in the army as a captain in the Ordnance Department, in connection with civilian personnel. He was secretary of the Civil Service Commission of the City of New York during the administration of Mayor Mitchell. His headquarters are in the Riggs Building, Washington, D. C.

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Program for Foreign Trade Convention

This Convention Will Take Up Every Phase of Foreign Trade on April 24, 25 and 26.

The complete program is now ready for the Foreign Trade Convention which is to be held in Chicago, Apr. 24, 25 and 26. The convention is to take up every phase of foreign trade, and includes such well-known experts as James A. Farrell, Hugh Frayne, Eugene Meyer, Jr., P. S. Steenstrup and others. Following is the program:

THURSDAY, APR. 24—MORNING

Session Topic: America's Need of Foreign Trade.

The Effect of Increased Productive Capacity Upon Our Foreign Trade—Edward Prizer, president, Vacuum Oil Co.

America's Financial Equipment for Foreign Trade, Fred I. Kent, vice president, Bankers Trust Co.

The Interest of Labor in Foreign Trade—Hugh Frayne, War Industries Board.

The Element of Labor Cost in American Exports—William Pigott, president, Seattle Car & Foundry Co.

AFTERNOON

The Vital Concern of Agriculture in Foreign Trade—Charles J. Brand, Chief of Bureau of Markets, U. S. Department of Agriculture.

The Mississippi Valley and Foreign Trade—John M. Parker, president, Mississippi Valley Association.

The Bargaining Tariff—Hon. William S. Culbertson, U. S. Tariff Commission.

The Stabilizing Effect on American Industry of a Definite Foreign Trade Policy—J. W. Hook, president, Allied Machinery Co. of America.

EVENING

Group I. Commercial Education for Foreign Trade.

Export Technique: Job Analysis of an Exporting House, Showing What Employees Should Know—D. E. Delgado, export manager, Eastman Kodak Co.

Cultural Equipment for Foreign Trade—John F. O'Hara, C.S.C., Notre Dame University.

Vocational Education for the Business of Exporting—R. S. MacElwee, assistant chief Bureau of Foreign and Domestic Commerce.

Report of Foreign Trade Training Survey of U. S. Bureau of Education—Glen Levin Swiggett, specialist in Commercial Education, U. S. Bureau of Education.

Group II. Foreign Trade Merchandising.

America's Foreign Commerce and the Necessity for Co-operation of All Interests to Protect It—W. H. Douglas, president, Arkell & Douglas, Inc.

The American Foreign Trader—John F. Fowler, vice-president, W. R. Grace & Co.

Can American Fabricated Products Hold Foreign Markets?—Wm. E. Peck, president, W. E. Peck & Co.

The Mechanism of Foreign Trade—Wm. H. Knox, president, Wm. H. Knox & Co.

Group III. Financing Foreign Trade.

Financing Our Excess of Exports—Eugene Meyer, Jr., managing director, War Finance Corporation.

Acceptances in Foreign Trade—D. C. Wills, Federal Reserve Bank, Cleveland.

American Branch Banks Abroad—James H. Carter, vice president, National City Bank.

Foreign Exchange—J. McCurrach, vice president, Continental and Commercial National Bank.

Group IV. Advertising for Foreign Trade.

Survey and Method—F. A. Arnold, manager, Foreign Department, Frank Seaman, Inc.

Media—Stanley Resor, president, J. Walter Thomson Co.

Foreign Advertising Successes—W. G. Hildebrandt, Gotham Advertising Company.

Discussion—J. W. Helburn, Canners Council of U. S. A.

FRIDAY, APR. 25—MORNING

Session Topic: The American Merchant Marine.

American Shipbuilding—Homer L. Ferguson, president, Newport News Shipbuilding and Drydock Co.

The World's Merchant Fleets To-day—W. S. Tower, Division of Planning and Statistics, U. S. Shipping Board.

The Future of the American Marine on the Pacific—Frederick J. Koster, president, San Francisco Chamber of Commerce.

The Relation of Law to the Development of Our Merchant Marine—Ernest J. Baldwin of the New York Bar.

The Relation of Inland Waterways to Foreign Trade—James E. Smith, president, Mississippi Valley Waterways Association.

AFTERNOON

Group V. Foreign Credits and Credit Information.

What Part Must Credit Play in the Expansion of Our Foreign Trade?—E. D. Fisher, vice president, Bank of Detroit.

Some of the Peculiar Difficulties and Problems in Foreign Credit Granting—F. D. Rock; credit manager, Armour & Co.

In What Form and Manner Can Exporters Coöperate for Developing Foreign Credit Information?—H. F. Beebe, Winchester Repeating Arms Co.

What Assistance May the Government Give Exporters in Selecting Safe Foreign Credit Risks?—E. E. Pratt, vice president, Overseas Products Corporation.

Group VI. Direct Selling and Representation.

Direct Selling in Europe—Larger Nations, . . .; Smaller Nations, H. S. Demarest, general export manager, Green-Tweed Company.

Direct Selling in South America—P. S. Steenstrup, General Motors Export Company.

Direct Selling in the Orient—Howard E. Cole, Standard Oil Company of New York.

Direct Selling through the Parcel Post—Maynard D. Howell, export manager, Montgomery Ward & Co.

Group VII. Export Combination—The Webb Law in Operation.

The Webb Law in Operation—John Walsh, chief counsel, Federal Trade Commission.

Forming an Export Association.

Discussion—William T. Nardin, American Canners' Export Association; E. E. Judd, American Webbing Manufacturers' Export Corporation; R. R. Fox, Simonds Manufacturing Co.

Group VIII. Ocean Service.

Marine Insurance—Benjamin Rush, president, American Foreign Insurance Association.

Improved Port Service and Foreign Trade—R. A. C. Smith, New York.

Freight Forwarding for Export—W. J. Riley, export manager, Judson Freight Forwarding Co.

Inland Traffic Management for Export—Andrew Young, traffic manager, American Sheet & Tin Plate Co.

FRIDAY, APR. 25

BANQUET, CONGRESS HOTEL, GOLD ROOM

The Relation of Diplomacy to Foreign Trade—Hon. Breckinridge Long, Third Assistant Secretary of State.

The Meaning of Foreign Trade to the Middle West—Hon. Frank C. Lowden, Governor of Illinois.

American Maritime Policy—James A. Farrell, chairman National Foreign Trade Council.

The Future of Our Foreign Trade—Edward N. Hurley, chairman, U. S. Shipping Board.

SATURDAY, APR. 26

Packing for Export—Captain H. R. Moody, Q. M. C., U. S. A.

The British Imports and Exports

Extract from *London Times* Indicates the Policy of the English Government Regarding Imports and Exports.

The following extract from the *London Times* of Mar. 11, is of interest as indicating the policy of the English Government with respect to imports and exports. It is a statement by Sir E. Geddes, Minister of National Service and Reconstruction, when challenged on this subject in the House of Commons by the Liberals.

"The policy of the Government in regard to imports was announced in the House recently. No import restrictions would be imposed, or continue to be imposed, on goods coming from any part of the empire without the assent of the War Cabinet, which would not be given unless some unforeseen necessity arose. All raw materials required for our industries would now be admitted without restriction. Some manufactured articles which were necessary as material for the manufactures of this country would also be admitted free without restriction, except so far as they were produced by industries which it was essential to foster in this country, and which required shielding. In such cases manufactured articles would be restricted.

"Manufactured articles would also be subject to restriction when not essential for consumption in this country, or when produced in this country by industries which required to be shielded from foreign competition while re-estabiishing themselves, industries which were disorganized for the purposes of war, or which had been created or encouraged to extend owing to circumstances arising out of the war. Restrictions in such cases covered a period extending not beyond Sept. 1 next, when there would be a further review of the whole situation.

The Time-Limit Policy

"The policy of the time-limit is quite clear. These are war restrictions; this is to deal with the transitional stage. We may find in the summer that the transitional stage is going to be prolonged. We may find it may be shortened, but it is not to be extended beyond Sept. 1 without further review. This is not the peace policy, this is the transitional policy, and what I am saying now is without prejudice to any policy which may or may not be arranged with regard to the permanent policy.

"The next thing, so that the House and the country may know exactly what is going on, is the form of instruction which has been given to the Board of Trade. The Board of Trade is to take steps to consider what shall be done to maintain in this country industries which it is the policy of the Government to foster—these are the industries such as I have stated—to consider definitely in detail the steps which are to be taken and to report to the Government. That policy need not be limited to any existing restriction.

"That, I think, covers as a general statement, not in detail, the policy on which the Government is working: raw materials free at once; part-manufactured materials which are the materials of other industries free, if possible, unless by so bringing in those materials we are going to kill out industries which it has been shown by the war it is definitely in the interests of this country to have in the country. Otherwise, of course, the imports, though not prohibited, will be licensed, and the total amounts brought in will be watched.

Sir E. Jones: "Are free goods coming right off the list at once?"

Sir E. Geddes: "Raw materials will."

Sir Jones: "Not manufactured articles?"

Sir Geddes: "The raw materials will be free; the partly manufactured goods will be free, as far as possible; completely manufactured goods not free, and, as far as possible, not to be brought in unless they are essential for use in this country."

Mr. Kiley: "Does that mean that the present manufactured goods imported under license will also cease?"

Sir Geddes: "No. Licensed imported goods will continue."

Mr. Kiley: "As now?"

Sir Geddes: "I cannot say entirely without change. All sorts of considerations must necessarily arise with regard to the position of the exchanges. Take the United States for instance. We have there the whole question of exchange to consider. Probably there will be a heavy drain on the Exchequer as the flow of raw material increases. It is not contemplated, it is no part of the policy of the Government to shut down the existing importation of manufactured goods, if without detriment to the interests of the country the importation can continue."

* * *

War Contract Settlements

The War Department authorizes publication of the following letter from Benedict Crowell, Assistant Secretary of War, Director of Munitions, to Carter Glass, Secretary of the Treasury:

"I have been asked by your department as to the basis of compensation which contractors receive on the termination of war contracts and the method by which that compensation may be secured. I have gone into this matter at some length in the memorandum which I enclose.

"Immediately upon the cessation of hostilities it became necessary for the War Department to reduce production on many thousands of its contracts for production of supplies for the army. The department immediately set up an organization to handle these adjustments so that the matter could be handled in a prompt and business-like manner. Some thirty-six local boards were established throughout the country composed of civilians and officers drawn from civil life who were familiar with what had been done under the contracts to be adjusted, and whose training and experience were such as to make it possible for them to handle these adjustments in a broad, business-like way. It is now nearly five months since these organizations were set up and since their machinery was available for the process of adjustment. Nevertheless, claims aggregating nearly one-half in the amount of money involved of the total to be adjusted have not yet been formally presented. This failure on the part of the contractors to present their claims promptly is occasioning the department great embarrassment. The organization which is handling this matter is essentially civilian in character and composed of men who have come into the department merely for the purposes of the war and who remain in this work only at a very great personal sacrifice and at the urgent request of the department.

"I do not feel that I can continue indefinitely to impose that hardship and have determined that all contractors who desire to avail themselves of the existing organization in the department for the settlement of their claims must present them prior to May 15, 1919, as after that date the method of handling these claims will necessarily be changed through the impossibility of continuing the present personnel."

Personals

W. F. McLAUGHLIN has been made factory superintendent of the Hyatt bearings division, General Motors Corporation, at Harrison, N. J.

E. E. WOOD, who for the past several years has been a member of the sales force of the Jones & Lamson Machine Co., Springfield, Vt., at Detroit, has been made sales manager.

H. W. CHAMPION, president of the Newton Machine Tool Works, Inc., Philadelphia, Penn., has gone to Europe where he will visit all the allied countries in the interest of his company.

J. W. BRUSSEL, formerly superintendent of the Wright-Martin Aircraft Corporation, Long Island City, has taken a position as factory manager of the Dyneto Electric Corporation, Syracuse, N. Y.

F. V. SARGENT has been appointed district manager of sales for the Chicago Pneumatic Tool Co., in the Boston territory succeeding T. S. Eggleson. He will make his headquarters at 182 High St., Boston, Mass.

C. R. BULLEY has been appointed sales metallurgist for the Hess Steel Corporation in Baltimore. He was formerly in charge of the design, building and operation of the heat-treating department of the Symington-Anderson Co., Rochester, N. Y. Prior to this he had several years' experience in the metallurgical department of the Halcomb, Midvale, and Carpenter Steel companies.

Obituary

FRANK W. HASKELL, president of the Carborundum Co. and its allied companies, died suddenly at Daytona, Florida, Apr. 2, 1919. Death was due to heart failure. He had been in Daytona since January and seemingly had been in the best of health. The news of his sudden death came very unexpectedly.

Mr. Haskell was born in Brooklyn, N. Y., Dec. 17, 1861. In 1879 he became connected with the Chicago, St. Paul & Milwaukee Ry. in a clerical capacity. In 1887 he took a position

FRANK W. HASKELL

with H. C. Frick and became identified with several of the many Frick interests. He remained with Mr. Frick until 1898, when he was made vice president of the Carborundum Co. at Niagara Falls, N. Y. One year later he was made president, succeeding Dr. Edward Goodrich Acheson, who organized and became president of the Acheson Graphite Co. Mr. Haskell had been a resident of Niagara Falls up to 1916, when he moved to Buffalo. He was a member of the Niagara Club, the Buffalo Club, the Country Club of Buffalo, the Park Club of Buffalo, the Duquesne Club of Pittsburgh, the Automobile Club of Buffalo and the Automobile Club of America. He was also a director of the Power City Bank.

J. E. JOHNSON, JR., mining and consulting engineer, 52 William St., New York City, died on Apr. 4 as the result of an automobile accident. Mr. Johnson was born at Long Dale, Va., in 1870. He received the degree of M.E. at Haverford College in 1891 and M.M.E. at Cornell University in 1892. He has been connected successively with the Baldwin Locomotive Works, the Straight Line Engine Co., Oswego Machine Works, Long Dale Iron Co., and Sanderson & Porter. He was a member of the American Society of Mechanical Engineers and a director of the American Institute of Mining and Metallurgical Engineers.

EDWIN H. WARREN a member of the firm of Woburn Gear Works, manufacturers of gears, sprockets chains, etc., Woburn, Mass., died at his home on Apr. 2, 1919, of pneumonia. He was 39 years old.

Business Items

The Schietz Tool, Gear and Machine Works has recently been established at Waterloo, Iowa, with Otto Schietz as president and manager. Mr. Schietz during the war was superintendent of the Gray Machine and Tool Co., Buffalo, N. Y., which was taken over by the Government as a standard shell plant during the war.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

A commercial agent in France wishes to secure the agency for the sale of iron and steel, tools of all kinds, agricultural implements, machinery and motors. Correspondence should be in French. No. 29014.

A company in England wishes to purchase pressed-steel unions with bronze seats. If satisfactory quotations are given, inquirer will place order for a large quantity. No. 29005.

A firm in the Netherlands desires to purchase and to secure an agency for the sale of tools, machinery, and hardware of all kinds, cutlery and novelties. Quotations should be given f.o.b. New York. Payment, cash against documents. Correspondence may be in English. Reference. No. 28996.

A company in Belgium desires to secure the representation from manufacturers of wood-working machines and tools. Correspondence should be in French. References. No. 29008.

An agency in desired by a man in Italy for the sale of motor cars, iron and steel pipes and fittings. Correspondence may be in English. References. No. 28988.

A man in Belgium desires to secure an agency for the sale of all kinds of machinery, metals, and metallic construction material. Correspondence should be in French. References. No. 28989.

A commercial agent in France desires to secure an agency for the sale in France and Morocco of metallurgical products, hardware and small tools. Correspondence should be in French. Reference. No. 28990.

A company in Norway desires to secure agencies for iron, steel, metals, heavy hardware machinery. Reference. No. 28991.

A man in France desires to secure an agency for the sale of industrial supplies, except oils and greases, and machine tools. Correspondence may be in English. Reference. No. 29018.

A commercial agent in France desires to secure an agency for the sale of machine tools, industrial supplies, belts, oils, greases, etc. Correspondence should be in French. Reference. No. 28932.

A merchant in France desires to secure an agency for the sale of mining machinery and mining materials and tools of all kinds. Correspondence may be in English. No. 29024.

A request has been received from a man in France that he be placed in touch with important metallurgic factories manufacturing such articles as iron, steel, copper pipes, accessories, and everything in the pipe trade, for high pressure and steam hydraulics. Correspondence may be in English. References. No. 29020.

A man in France wishes to purchase and to secure an agency for the sale of cast steel, mining bars, high-speed steels, steel tools, raw iron, plates, boiler plates, ship plates, and all articles included in the steel and tool trade. Correspondence may be in English. Reference. No. 29026.

Forthcoming Meetings

American Association of Engineers. Annual meeting has been scheduled for May 13 at Chicago.

American Foundrymen's Association. Annual convention and exhibit will be held in Philadelphia the week of Sept. 29, 1919. C. E. Hoyt, secretary-treasurer, Harris Trust Building, Chicago, Ill.

American Society of Mechanical Engineers. Spring meeting to be held at Hotel Statler, Detroit, Mich., June 16-19, 1919. Secretary, Calvin Rice, 29 West 39th St., New York City.

American Society for Testing Materials will hold its twenty-second annual meeting at Atlantic City on June 24-27, headquarters at the Hotel Traymore. Secretary-treasurer, University of Pennsylvania, Philadelphia, Penn.

Boston Branch National Metal Trades Association. Monthly meeting on first Wednesday of each month. Young's Hotel. Donald H. C. Tullock, Jr., secretary. Room 41, 166 Devonshire St., Boston, Mass.

Engineers' Club of Philadelphia. Regular meeting the third Tuesday of the month, with the exception of July and August. Lewis H. Kenney is the chairman of committee on papers.

Engineers' Society of Western Pennsylvania. Monthly meeting, third Tuesday; section meeting, first Tuesday. Elmer K. Hiles, secretary, Oliver Building, Pittsburgh, Penn.

National Foreign Trade Council. Annual meeting at Chicago, Apr. 24-26. O. K. Davis, secretary, 1 Hanover Square, N. Y.

National Machine Tool Builders' Association. Spring convention to be held at Atlantic City, N. J., May 12 and 13, with headquarters at Hotel Traymore. C. Wood Walter, Cincinnati, Ohio, secretary.

National Metal Trades' Association will hold its 21st annual convention at the Hotel Astor, New York, Apr. 23 and 24.

New England Foundrymen's Association. Regular meeting, second Wednesday of each month. Exchange Club, Boston, Mass. Fred F. Stockwell, 205 Broadway, Cambridgeport, Mass.

Philadelphia Foundrymen's Association. Meeting first Wednesday of each month. Manufacturers' Club, Philadelphia, Penn., Howard Evans, secretary, Pier 45, North Philadelphia, Penn.

Providence Engineering Society. Monthly meeting fourth Wednesday of each month. A. E. Thornley, corresponding secretary, P. O. Box 796. Providence, R. I.

Rochester Society of Technical Draftsmen. Annual meeting and election of officers to be held June 28. Other meetings on Apr. 24, when Allen S. Crocker will speak; also on May 29 with Maurice A. Wilder as the speaker. Secretary, O. L. Angevine, Jr., Rooms 131-137, Sibley Block, Rochester, N. Y.

Rochester Society of Technical Draftsmen. Monthly meeting, last Thursday. O. L. Angevine, Jr., secretary, 857 Genesee St., Rochester, N. Y.

Superintendents' and Foremen's Club of Cleveland. Monthly meeting, third Saturday. Philip Frankel, secretary, 310 New England Building, Cleveland, Ohio.

Technical League of America. Regular meeting, second Friday of each month. Oscar S. Teale, secretary, 240 Broadway, New York.

United States Chamber of Commerce. Annual convention to be held at St. Louis, Apr. 28, 29 and 30.

Western Society of Engineers, Chicago, Ill. Regular meetings, first, second, third and fourth Mondays of each month, except July and August. Edgar S. Nethercut, secretary, 1735 Monadnock Block, Chicago, Ill.